CHAPTER 3
AFFECTED ENVIRONMENT

3.1 INTRODUCTION

This chapter provides a description of the biological, physical, and socioeconomic characteristics, including human uses, that could be affected by any future actions (including but not limited to any decisions to lease and/or develop geothermal resources) that may be taken consistent with implementing one of the alternatives considered in this EIS. Information from broad-scale assessments were used to help set the context for the planning area. The information and direction for National Forest System lands has been further broken down into fine-scale assessments and information where possible. Specific aspects of each resource discussed in this section (e.g., water supply, air emissions, weeds, off-highway vehicle use) were raised during the public and agency scoping process. The level of information presented in this chapter is commensurate with and sufficient to assess potential effects of any future actions (including but not limited to leasing and developing geothermal resources) that may be taken consistent with the alternatives described in Chapter 2.

The planning area for the EIS is the area of geothermal potential located in the Nevada portion of the Bridgeport Ranger District, one area on the Austin Ranger District, one area on the Tonopah District, and one area on the Ely Ranger District. The planning area includes Forest Service-administered surface lands with minerals under federal ownership that have geothermal potential and the subsurface federal geothermal mineral estate on other lands (see Section 1.9.1).

This section contains a description of the biological and physical resources of the planning area and follows the order of topics addressed as follows:

- Land Use, Recreation, and Special Designations;
- Geologic Resources and Seismic Setting;

- Energy and Mineral Resources;
- Paleontological Resources;
- Soil Resources;
- Water Resources;
- Air Quality and Climate;
- Vegetation;
- Fish and Wildlife;
- Threatened, Endangered, and Special Status Species;
- Wild Horse and Burros;
- Prime Farmlands;
- Livestock Grazing;
- Cultural Resources;
- Tribal Interests and Traditional Cultural Resources;
- Natural Scenic and Historic Trails;
- Visual Resources;
- Social Interests, Economics, and Environmental Justice;
- Health and Safety;
- Noise;
- Hazardous Materials; and
- Climate Change.

Table 3-1, Critical Resources Identified through Scoping, lists identified critical resources and where they are addressed in this EIS.

Table 3-1
Critical Resources Identified Through Scoping

Resource	Corresponding Section
Air Quality	Air Quality and Climate
Special Designated Areas	Land Use, Recreation, and Special Designations
Cultural Resources	Cultural Resources and Tribal Interests and Traditional Cultural Resources
Hazardous Materials	Health and Safety
Invasive and Nonnative Species	Vegetation
Migratory Birds	Fish and Wildlife
Native American Religious Concerns	Tribal Interests and Traditional Cultural Resources
Threatened and Endangered Species	Threatened and Endangered Species and Special Status Species
Water Quality (Surface/Ground)	Water Resources
Wetlands/Riparian Zones	Vegetation
Wild and Scenic Rivers	Land Use, Recreation, and Special Designations
Wilderness	Land Use, Recreation, and Special Designations

3.2 LAND USE

This section is a discussion of the current land ownership and use within the region of influence (ROI) for the planning area. The ROI is the land area within and adjacent to four decision areas. See **Figures 3-1**, Bridgeport Geothermal Decision Area Surface Administration, and **3-2**, Austin, Ely, Tonopah Geothermal Decision Areas Surface Administration, for maps of surface administration in the planning area.

3.2.1 Policies and Plans

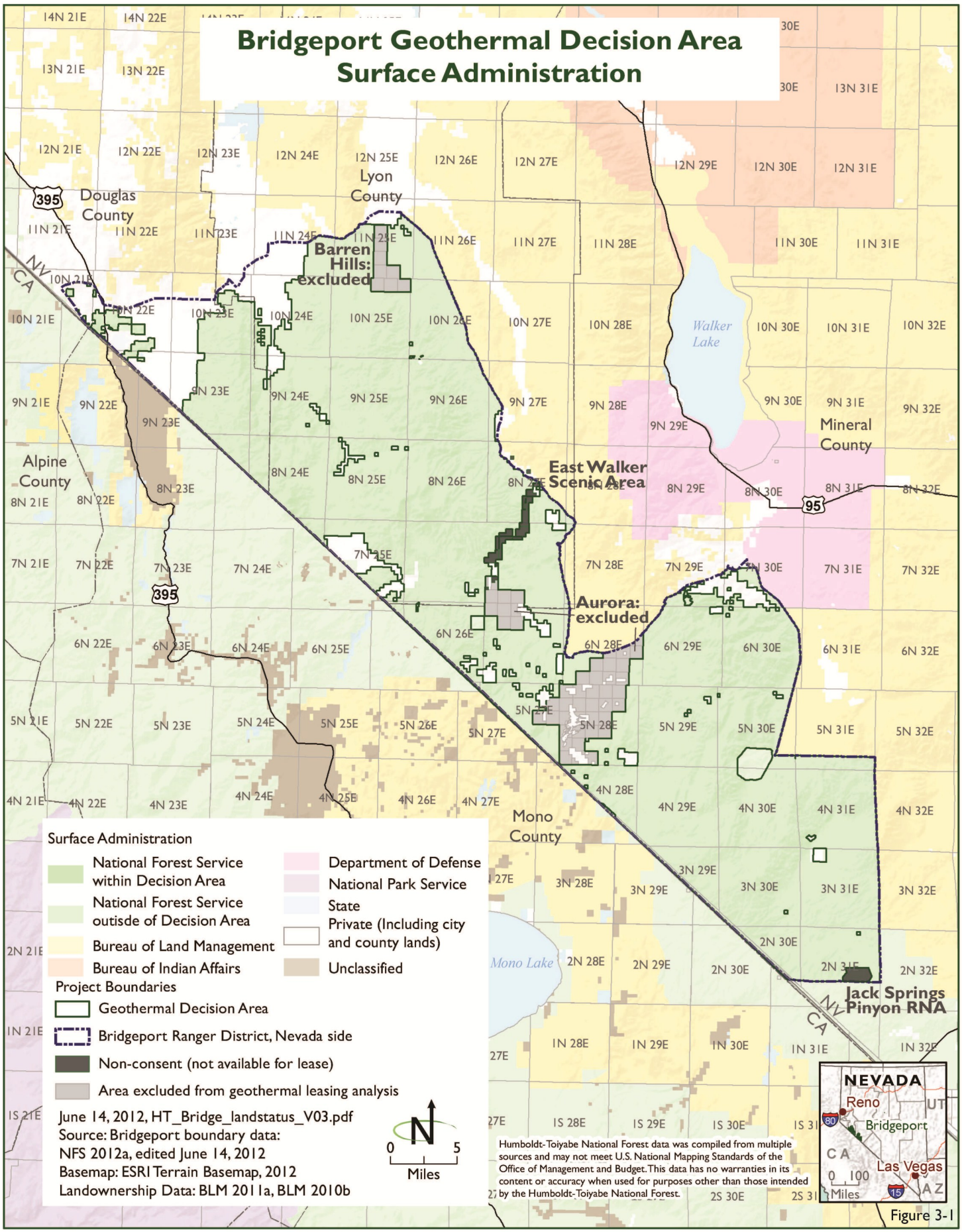
The National Forest Management Act of 1976 requires the Secretary of Agriculture to assess National Forest System lands, develop a management program based on multiple-use, sustained-yield principles, and implement a resource management plan for each unit of the National Forest System. The primary statutes which authorize the disposal of renewable resources on National Forest System lands include the Organic Administration Act, Multiple-Use Sustained-Yield Act, and the Bankhead-Jones Farm Tenant Act. The Humboldt-Toiyabe National Forest operates under the direction of the RODs for the Humboldt and Toiyabe LRMPs. In accordance with the Steam Act, the BLM administers geothermal leasing on National Forest System lands, with the concurrence of the Forest Service.

3.2.2 Land Use Authorizations

Land use authorizations include various authorizations and agreements to use National Forest System lands, such as right-of-way (ROW) grants, road use agreements, and associated temporary use permits. Land use authorizations are issued for a variety of purposes, both short and long term. Short-term uses include agricultural leases and other uses involving minimal land improvements or disturbances. Long-term uses include ROW grants for power lines, highways, roads, pipelines, fiber optics, communication sites, electric power generation sites, and irrigation.

Rights-of-way and Utility Corridors

As a general rule, a ROW is needed whenever a project is built on public lands. A ROW grant is an authorization to use a specific piece of public land for a certain project, such as roads, pipelines, transmission lines, and telephone lines. Current policy for utilities is to minimize additional impacts and proliferation of separate ROWs in common, to the extent practical. The grant authorizes rights and privileges for a specific use of the land for a specific period of time. Generally, a ROW is granted for a term commensurate with the life of the project. A more complete description to the Forest Service ROW program is found in Forest Service Manual 5460.


Bridgeport Geothermal Decision Area
Surface Administration
Douglas County
Lyon County
Mineral County
Alpine County
Mono County
Barren Hills: excluded
East Walker Scenic Area
Aurora: excluded
Jack Springs Pinyon RNA
Walker Lake
Mono Lake
NV
CA
395
95
Surface Administration
National Forest Service within Decision Area
National Forest Service outisde of Decision Area
Bureau of Land Management
Bureau of Indian Affairs
Department of Defense
National Park Service
State
Private (Including city and county lands)
Unclassified
Project Boundaries
Geothermal Decision Area
Bridgeport Ranger District, Nevada side
Non-consent (not available for lease)
Area excluded from geothermal leasing analysis
June 14, 2012, HT_Bridge_landstatus_V03.pdf
Source: Bridgeport boundary data: NFS 2012a, edited June 14, 2012
Basemap: ESRI Terrain Basemap, 2012
Landownership Data: BLM 2011a, BLM 2010b
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Humboldt-Toiyabe National Forest data was compiled from multiple sources and may not meet U.S. National Mapping Standards of the Office of Management and Budget. This data has no warranties in its content or accuracy when used for purposes other than those intended by the Humboldt-Toiyabe National Forest.
NEVADA
Reno
Bridgeport
Las Vegas
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AZ
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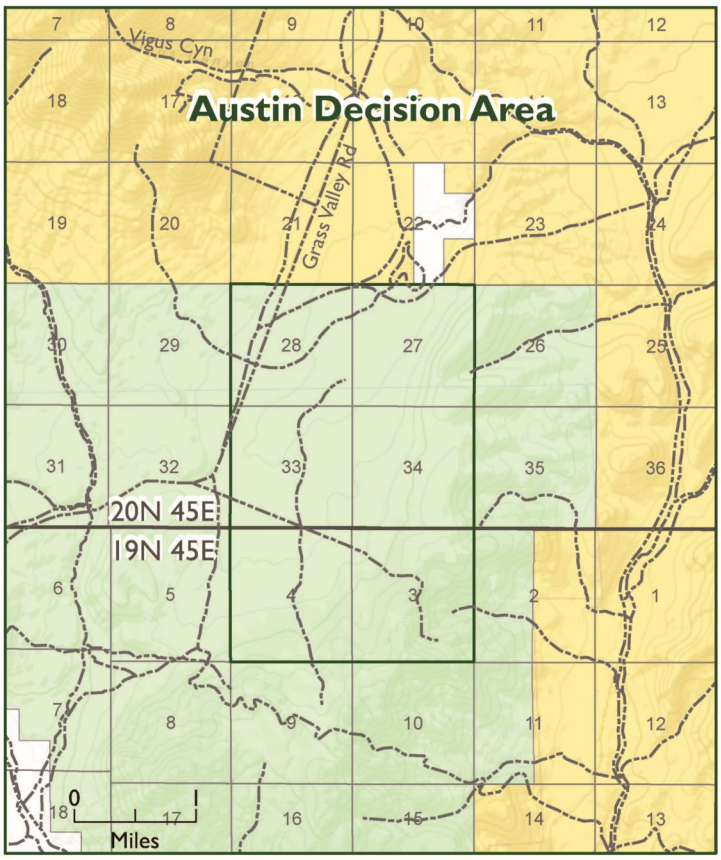
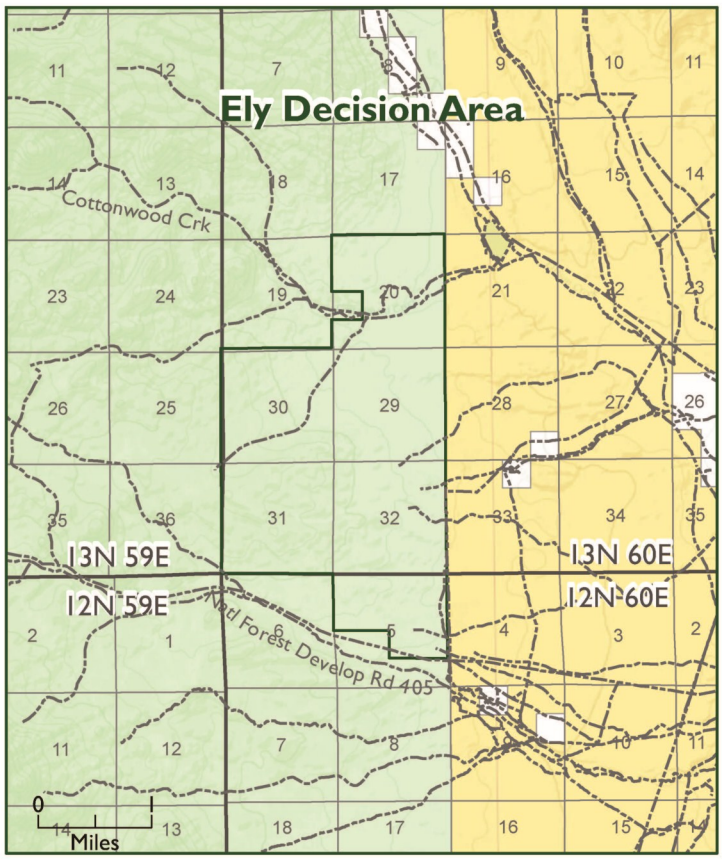
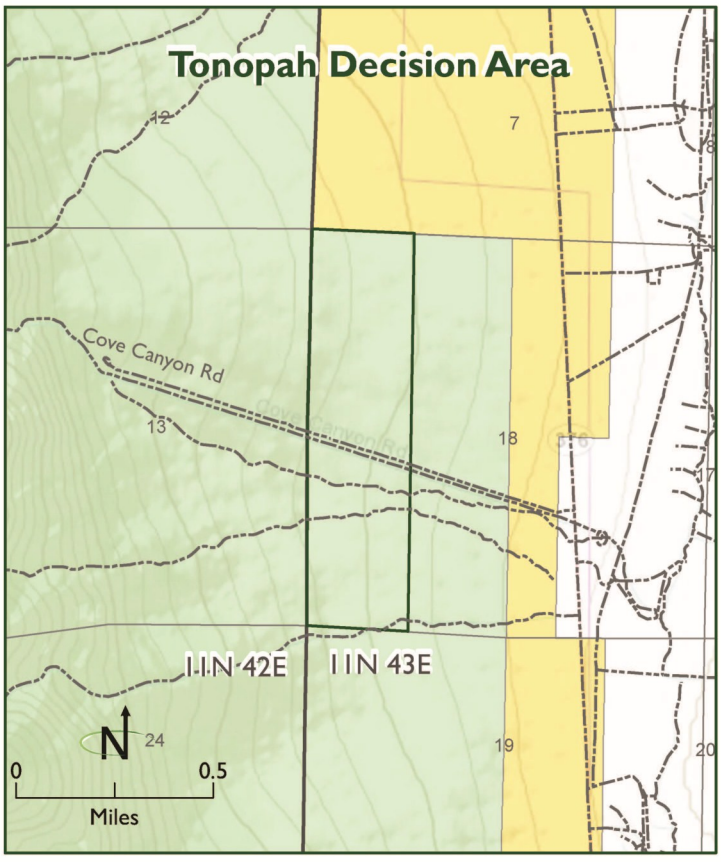
Miles

Figure 3-1

Austin, Ely, Tonopah Geothermal Decision Areas
Surface Administration







Geothermal Decision Area

Surface Administration

- National Forest Service within Decision Area
- National Forest Service outside of Decision Area
- Bureau of Land Management
- Private

June 14, 2012, HT_AET_landstatus_V03.pdf
Source - Austin, Ely, and Tonopah boundary data: NFS 2012a, edited June 14, 2012
Basemap: ESRI Terrain Basemap 2012
Surface Administration: BLM 2010b

Humboldt-Toiyabe National Forest data was compiled from multiple sources and may not meet U.S. National Mapping Standards of the Office of Management and Budget. This data has no warranties in its content or accuracy when used for purposes other than those intended by the Humboldt-Toiyabe National Forest.

Figure 3-2

Land Use Permits and Leases

A lease is an authorization to possess and use public land for a fixed period of time. A lease is issued when there is going to be substantial construction, development, and improvement, and there is an investment of large amounts of capital that will be amortized over time. Permits are authorized when uses of public lands will be short term and involve little or no land improvement, construction, or investment. Permits and leases are subject to process and monitoring fees and a fair market rental value.

Withdrawals

A land withdrawal is a real estate management tool to implement resource management planning prescriptions or to transfer administrative jurisdiction from one federal agency to another. A withdrawal creates a title encumbrance on the land, thereby restricting an agency's ability to manage its lands under multiple use management principles. The restrictions generally segregate the lands from some or all the public land laws and some or all of the mining and mineral leasing laws for a specific period of time, generally 20 years for post-Federal Land Policy and Management Act withdrawals. Withdrawn land can be closed to mining, mineral leasing, or mineral material disposal.

3.2.3 Bridgeport Geothermal Decision Area

Land Use

The Bridgeport Geothermal Decision Area covers approximately 602,115 acres and is located throughout the west-central part of Nevada, including land in Lyon, Douglas, and Mineral Counties. Lands immediately adjacent to the proposed planning area include National Forest System lands, BLM, Department of Defense, and private lands. There are no population centers within the Bridgeport Geothermal Decision Area. Nearby population centers include Yerington in Lyon County and Hawthorne in Mineral County. The Forest Service manages the National Forest System lands in the Bridgeport Ranger District for multiple uses, including recreation, grazing, wildlife habitat, fisheries, watersheds, and heritage resource protection and interpretation. Dispersed recreation is the predominant sensitive use in this area. Lands surrounding the decision area are primarily non-developed with dispersed residential development and agricultural uses.

Based on available data, there is one ROW corridor for a transmission line and two communication sites located in the Bridgeport Geothermal Decision Area.

Access

Various portions of the Bridgeport Geothermal Decision Area can be accessed via state highways and county roads. Roads in the decision area serve two primary functions: access and recreational opportunities. The recreational aspects of roads are addressed in Section 3.3. There are approximately 1,151 miles of roads within this decision area, including primary highways, improved

gravel, improved dirt roads, unimproved, unimproved four-wheel drive, and trails. The majority of roads are unimproved.

3.2.4 Austin Geothermal Decision Area

Land Use

The Austin Geothermal Decision Area is located in Lander County in north-central Nevada. The decision area is located in the Austin Ranger District and consists of approximately 3,961 acres. Lands adjacent to the Austin Geothermal Decision Area include BLM and private lands to the north and National Forest System lands to the east, south, and west. There are no population centers within the decision area. Nearby population centers include the community of Austin, approximately eight miles west of the decision area. Grazing is the primary land use in the decision area. Lands surrounding the decision area are primarily non-developed with livestock grazing.

Based on available data, there are no ROW corridors or communication sites located in the Austin Ranger District planning area. There is a transmission line located approximately 0.2 miles outside this planning area. A transmission line ROW was approved as part of the McGinness Hills Geothermal Development Project (BLM 2011a) and would cross the decision area for 1.3 miles. This ROW and the associated project are discussed in detail under **Chapter 5**, Cumulative Impacts and Other Considerations.

Access

The Austin Geothermal Decision Area can be accessed via Grass Valley Road. Roads in the decision area serve two primary functions: access and recreation opportunities. The recreational aspects of roads are addressed in Section 3.3. There are approximately 15.6 miles of roads within this decision area, and include improved dirt roads, unimproved, unimproved four-wheel drive, and trails. The majority of roads are unimproved.

3.2.5 Ely Geothermal Decision Area

Land Use

The Ely Geothermal Decision Area is located in White Pine County in east-central Nevada. The total decision area in the Ely Ranger District consists of approximately 3,538 acres. Lands immediately adjacent to the decision area include National Forest System lands to the north, west, and south and BLM lands to the east. There are no population centers within the Ely Geothermal Decision Area. Nearby population centers include the community of Lund, approximately 14 miles west of the planning area. Grazing is the primary land use in the area. Lands surrounding the decision area are primarily non-developed with dispersed residential development and agricultural uses.

Based on available data, there are no ROW corridors or communication sites located in the Ely Geothermal Decision Area.

Access

The Ely Geothermal Decision Area can be accessed via unimproved unnamed roads. Roads in the decision area serve two primary functions: access and recreation opportunities. The recreational aspects of roads are addressed in Section 3.3. There are approximately 9.5 miles of roads within this planning area, including improved dirt roads, unimproved, and unimproved four-wheel drive. The majority of roads are unimproved four-wheel drive.

3.2.6 Tonopah Geothermal Decision Area

Land Use

The Tonopah Geothermal Decision Area is located in Nye County in north-central Nevada. The total decision area in the Tonopah Ranger District consists of approximately 166 acres. Lands adjacent to the proposed planning area include BLM lands to the north and National Forest System lands to the east, south, and west. There are no population centers within the Tonopah Geothermal Decision Area. Nearby developments include Darroughs Hot Springs, located approximately one mile to the east, and Carvers, located approximately two miles southeast. Lands surrounding the decision area are primarily non-developed with dispersed residential development and agricultural uses.

Based on available data, there are no ROW corridors or communication sites located in the Tonopah Geothermal Decision Area.

Access

The Tonopah Geothermal Decision Area can be accessed via Cove Canyon Road, which is an unimproved road that passes through the decision area. No other roads are known to exist.

3.3 RECREATION

3.3.1 Regulatory Framework

The regulatory framework for recreation is provided in the 2008 Geothermal PEIS. Since publication of the PEIS, the Humboldt-Toiyabe National Forest completed a route designation process for the planning areas in 2009 and 2010, whereby motorized vehicles are restricted to the route network displayed on motor vehicle use maps.

3.3.2 Bridgeport Geothermal Decision Area

The Bridgeport Ranger District straddles the California-Nevada state border, with the majority of developed recreation sites located in California. Numerous motorized routes crisscross the study area with the northern and southern portions having the densest motorized trail systems.

The Desert Creek Campground, located west of Highway 338 on Forest Road 027 within the Wellington Hills area, provides a remote, undeveloped desert

camping experience. Use is low, but the area provides visitors with fishing and off-highway vehicle riding opportunities.

The California National Historic Trail passes through the Pine Grove North area in the northern portion of the study area. This trail marks the paths taken by early European settlers migrating to California in the 1840s and 1850s.

Nevada Department of Wildlife (NDOW) Hunt Units 192, 201, 202, 203, 204, 206, and 291 are located partially or entirely within the decision area. Pronghorn antelope can be hunted in Units 202, 203, and 204; desert bighorn sheep are hunted in Unit 202; and mule deer (*Odocoileus hemionus*) are hunted within all of these units.

Other uses in the study area include dispersed camping, recreational fishing, hiking, mountain biking, scenic driving, and wildlife viewing. Use is generally light.

3.3.3 Austin Geothermal Decision Area

There are no developed recreation facilities within this area. The motor vehicle use map allows motorized vehicle travel on several routes, though use is light. The Bob Scott Campground is located approximately six miles southwest of the planning area on the same side of US Highway 50. The campground receives heavy use and features potable water, flush toilets, and tent and RV camping access. The campground also provides easy access to mountain biking trails on the north side of US Highway 50.

The decision area is located within NDOW Hunt Unit 152, which is managed for mule deer and pronghorn antelope hunting.

3.3.4 Ely Geothermal Decision Area

There are no developed recreation facilities within this area. The motor vehicle use map allows motorized vehicle travel on several routes, though use is light.

The decision area is located within NDOW Hunt Unit 131, which is managed for mule deer, elk, pronghorn antelope, sheep, and upland game hunting.

3.3.5 Tonopah Geothermal Decision Area

There are no developed recreation facilities within this area. The motor vehicle use map allows motorized vehicle travel on several routes, though use is light. The North/South Twin Road Trailhead is located approximately five miles north-northwest and provides hiking and horseback access into the Toiyabe Mountains and the Toiyabe Crest Trail. The trailhead has one toilet and receives light use.

The decision area is located within NDOW Hunt Unit 173, which is managed for mule deer, pronghorn antelope, and desert bighorn sheep hunting.

3.4 SPECIAL DESIGNATIONS

The following section describes special management designations on National Forest System lands in the planning area, including inventoried roadless areas (IRAs), RNAs, National Historic Trails, and Wild and Scenic Rivers. These special areas have been designated to protect unique characteristics and contain resources that have been identified as scientifically, educationally, or recreationally important. Special management is administered with the intent to improve manageability of the areas. Special area designations on National Forest System lands can be established by Congress, Presidential Proclamation, or administratively. The Forest Service has the authority to adopt special management designations through Forest Plan amendments or revisions.

3.4.1 Bridgeport Geothermal Decision Area

There are no Wilderness Areas or Wild and Scenic Rivers in or adjacent to this area. However, there is a segment of the East Walker River within the decision area that has been identified as potentially eligible as a Wild and Scenic River. The 161,180-acre Carson-Iceberg Wilderness, located in California, is approximately eight miles from the Bridgeport Geothermal Decision Area's northwestern border. The 13,400-acre Burbank Canyons Wilderness Study Area is located approximately 2.5 miles north of the decision area in Nevada. The 4,240-acre Slinkard Valley Area of Critical Environmental Concern and the 2,190-acre Bodie Bowl Area of Critical Environmental Concern are both located in California, within five miles of the decision area.

There are 22 IRAs located partially or entirely within the decision area, totaling approximately 406,200 acres. The IRAs within the decision area are outlined in **Table 3-2**, Inventoried Roadless Areas within the Bridgeport Decision Area and shown on Figure 3-17.

East Walker Scenic Area

The East Walker Scenic, which is described in Section 1.7.2, is located within the Bridgeport Ranger District along the Walker River from the confluence of the Rough Creek to County Road 3C.

Jacks Spring RNA

Jacks Spring RNA encompasses 1,272 acres of National forest System lands at the southern end of the Bridgeport Ranger District and is in Mineral County Nevada. The legal location is sections 13,14,15,22,23 and 24 of Township 2 north, Range 31 East. This area was selected as an RNA because of its undisturbed old-growth stands of pinyon and juniper. See Figure 1-2.

California National Historic Trail

Approximately 5 miles of the California National Historic Trail crosses the Bridgeport Geothermal Decision Area at the northern end of the area (Figure 3-17).

Table 3-2
Inventoried Roadless Areas within the Bridgeport Decision Area

Name	Total Acres	Acres within Decision Area
Pine Grove North	8,749	7,143
Mount Etna	20,527	20,002
Wellington Hills	21,011	20,998
Pine Grove South	88,936	88,753
Fourmile Hill	15,719	15,712
Lobdell Summit	7,791	7,790
Pine Grove Summit	6,070	6,070
Wiley	6,865	6,852
Wild Horse Mountain	30,225	1,379
Fourth of July Spring	5,834	3,124
Sweetwater	25,188	5,889
Rough Creek	8,475	5,503
West Walker	6,178	5,651
Butler Mountain	25,868	25,755
Chinese Camp	19,546	12,655
Devil's Gate	10,593	617
Aurora Crater	5,688	1,771
Long Valley	50,457	49,336
Mt. Hicks	15,694	12,254
Excelsior Mountains	69,041	68,967
Larken Lake	4,160	3,889
Huntoon	36,277	36,085
TOTAL	520,883	409,152

3.4.2 Austin Geothermal Decision Area

The Pony Express National Historic Trail passes within approximately 3 miles of the southern boundary of the decision area.

3.4.3 Ely Geothermal Decision Area

There are no Wilderness Areas or Wild and Scenic Rivers in or adjacent to this decision area. The 20,490-acre Red Mountain Wilderness is located approximately 0.25 miles southwest of the decision area and the 22,370-acre Bald Mountain Wilderness is approximately 3.5 miles north of the decision area.

Approximately 2,650 acres of the Cottonwood Roadless Area and 160 acres of the Indian Creek Roadless Area overlap the decision area.

3.4.4 Tonopah Geothermal Decision Area

There are no Wilderness Areas or Wild and Scenic Rivers in or adjacent to this area. However, the 115,000-acre Arc Dome Wilderness is located approximately one-half-mile to the west.

The Arc Dome-Carvers Roadless Area overlaps with approximately 160 acres of the decision area.

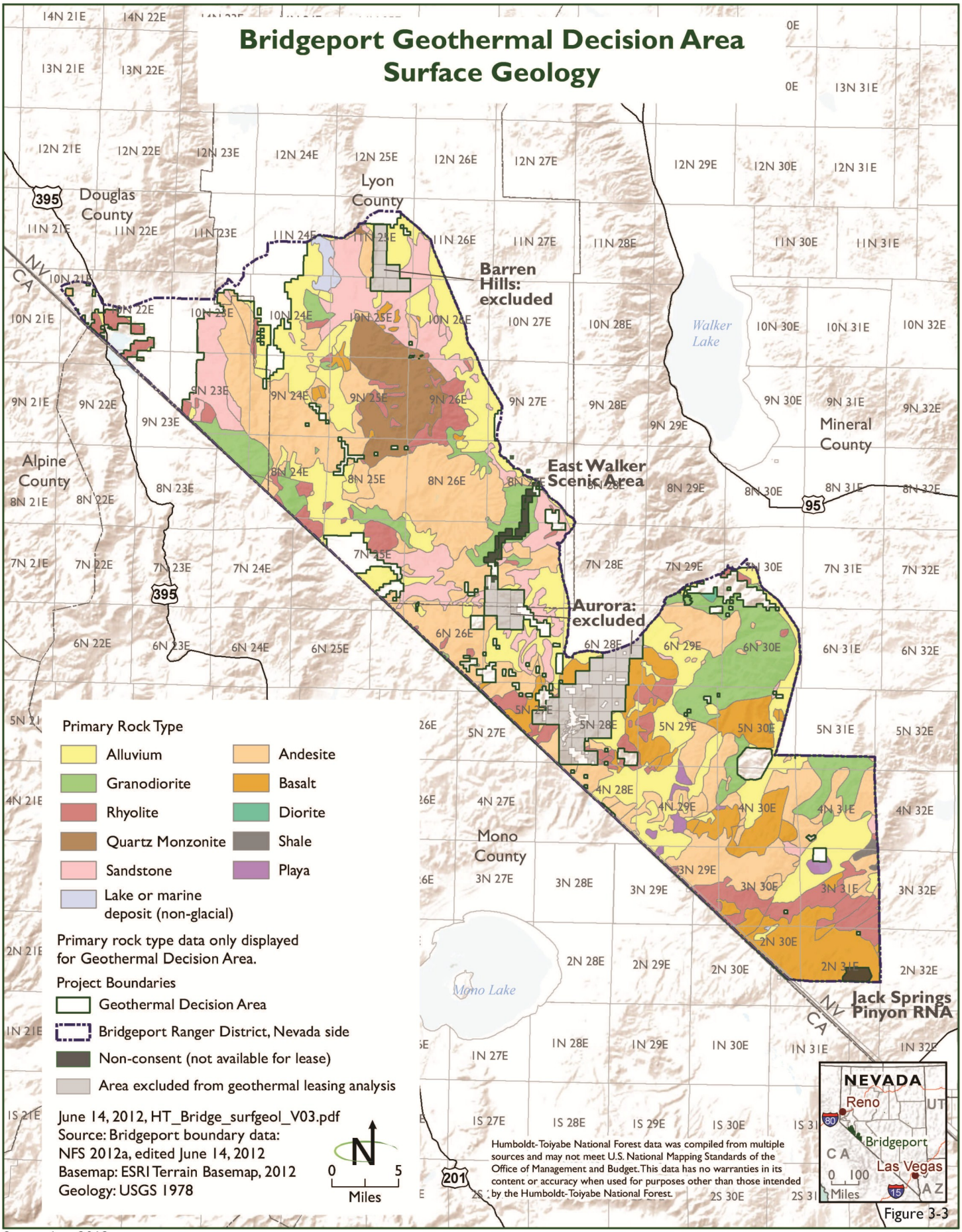
3.5 GEOLOGIC RESOURCES AND SEISMIC SETTING

3.5.1 Geology of the Planning Area

The planning area lies within the Great Basin region of the Basin and Range geological province. This province, characterized by steep, elongate mountain ranges alternated with long expanses of flat, dry desert, extends from eastern California to central Utah, and from southern Idaho into the state of Sonora in Mexico. Within the Basin and Range province the earth's crust and upper mantle have been stretched up to 100 percent of its original width. The entire region has been, and continues to be, subjected to extension that thinned and cracked the crust as it pulled apart, creating large, north-south trending faults (BLM and Forest Service 2008).

Expansion occurs in a roughly east-southeast to west-northwesterly direction at the average rate of 13 millimeters per year (USGS 2008). Beginning approximately 20 million years ago, the upthrown side of these faults began to form mountains that rise abruptly and steeply, and the down-dropped side created broad, low valleys resulting in a distinctive alternating pattern of linear mountain ranges and valleys. The fault plane extends deep into the crust, usually at a 60 degree angle. In places, the relief, or vertical difference between the two sides, is as much as 10,000 feet. As the ranges rise, they are immediately subject to weathering and erosion from water, ice, wind, and other agents (USGS 2004).

The mountain ranges consist of complexly deformed late Precambrian and Paleozoic rocks and some Mesozoic granitic rocks in the western part of the province. Cenozoic volcanic rocks are widespread throughout the province. Eroded material washes down mountain sides, often covering young faults until they rupture again. Sediment collects in adjacent valleys, in some places covering bedrock under thousands of feet of rock debris (BLM and Forest Service 2008). **Figures 3-3**, Bridgeport Geothermal Decision Area Surface Geology, and **3-4**, Austin, Ely, Tonopah Geothermal Decision Areas Surface Geology, show the surface geology of the four decision areas and including the Bridgeport, Austin, Tonopah, and Ely Ranger Districts.


Bridgeport Geothermal Decision Area
Surface Geology
Douglas County
Lyon County
Mineral County
Alpine County
Mono County
Barren Hills: excluded
East Walker Scenic Area
Aurora: excluded
Jack Springs Pinyon RNA
Walker Lake
Mono Lake
NV
CA
395
95
201
Primary Rock Type
Alluvium
Granodiorite
Rhyolite
Quartz Monzonite
Sandstone
Lake or marine deposit (non-glacial)
Andesite
Basalt
Diorite
Shale
Playa
Primary rock type data only displayed for Geothermal Decision Area.
Project Boundaries
Geothermal Decision Area
Bridgeport Ranger District, Nevada side
Non-consent (not available for lease)
Area excluded from geothermal leasing analysis
June 14, 2012, HT_Bridge_surfgeol_V03.pdf
Source: Bridgeport boundary data: NFS 2012a, edited June 14, 2012
Basemap: ESRI Terrain Basemap, 2012
Geology: USGS 1978
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Miles
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NEVADA
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CA
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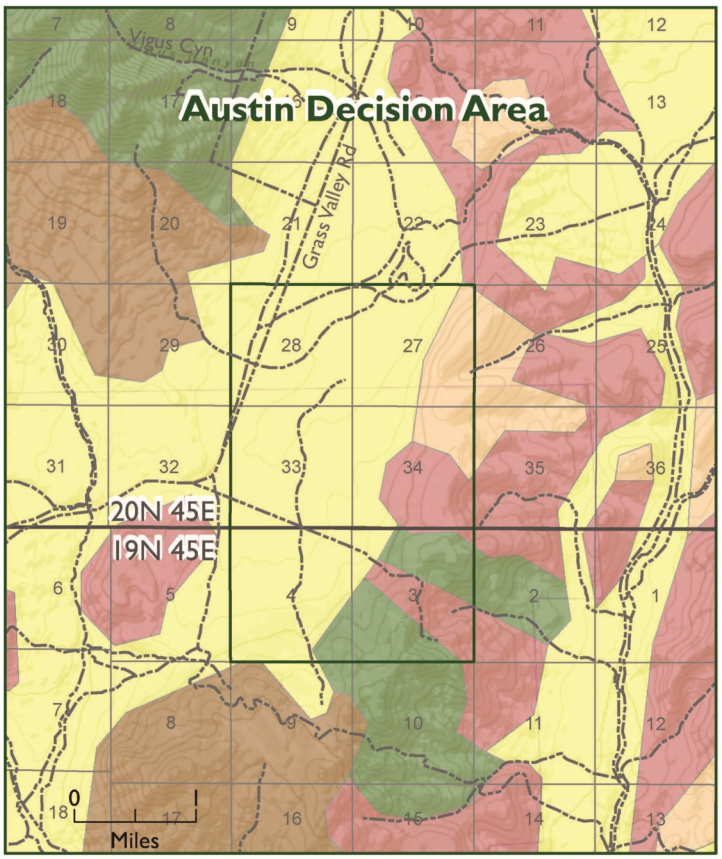
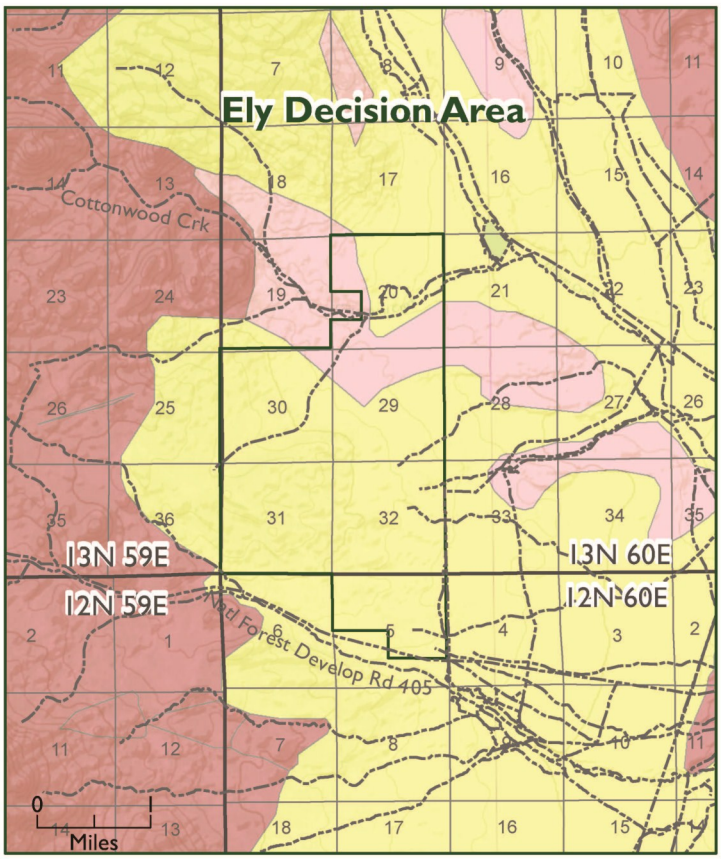
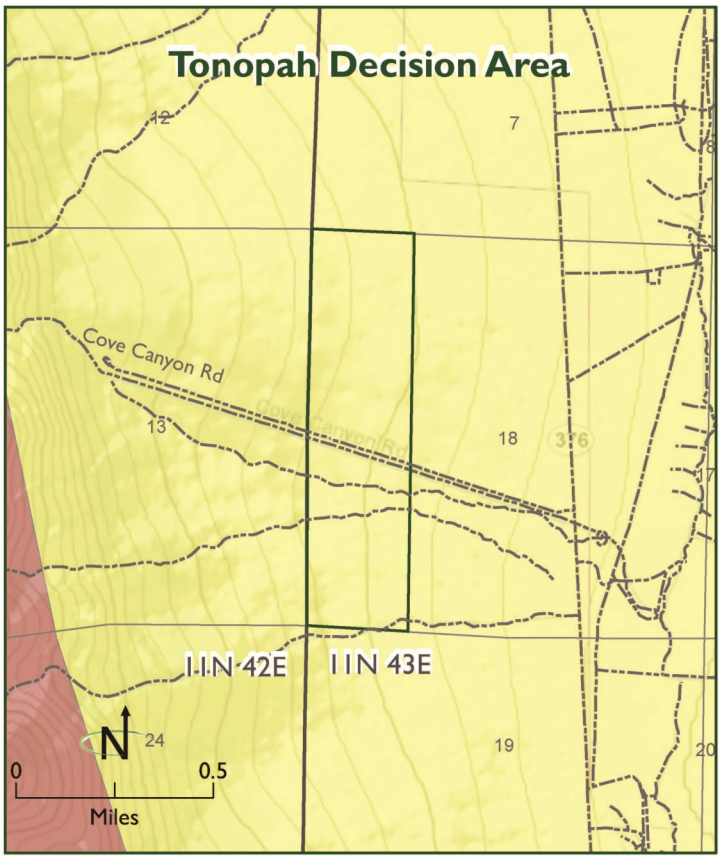
Figure 3-3

Austin, Ely, Tonopah Geothermal Decision Areas
Surface Geology







Geothermal Decision Area

Primary Rock Type
- Chert
- Alluvium
- Rhyolite
- Quartz Monzonite
- Sandstone
- Andesite

June 14, 2012, HT_AET_surfgeol_V03.pdf
Source - Austin, Ely, and Tonopah boundary data: NFS 2012a, edited June 14, 2012
Basemap: ESRI Terrain Basemap 2012
Geology: USGS 1978

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Figure 3-4

3.5.2 Seismic Setting of the Planning Area

Many of the range-bounding faults are still active. Nevada is the third most seismically active state in the nation (behind California and Alaska); over the last 150 years, a magnitude 7 or greater earthquake has occurred somewhere in Nevada about once every 30 years. Roughly 20 percent of the faults in this area have evidence of surface rupture in the past 15,000 years. Except for aftershock activity associated with some historical ruptures in the province, it is difficult to associate recorded seismicity with specific faults. There are virtually no examples of foreshock activity preceding large earthquakes. For the most part, normal faults within the Great Basin seem to be aseismic and locked, but some may be closed to the point of failure (USGS 2008).

Most faults are normal, although some are strike-slip faults. The most apparent zone of strike-slip faults in Nevada is in a 50-mile wide swath along the northwest trending border with California, the Walker Lane. These northwest-trending faults are accommodating part of the motion between the Pacific Plate, which is moving relatively northwest, and the North American Plate, which is moving relatively southeast. The San Andreas Fault takes up most of the motion between these two plates. The generally north-south trend of mountain ranges in most of Nevada transforms into northwest-trending ranges within the Walker Lane (Nevada Bureau of Mines and Geology 2010). **Figures 3-5**, Bridgeport Geothermal Decision Area Faults, and **3-6**, Austin, Ely, Tonopah Geothermal Decision Areas Faults, show the fault lines in the decision areas.

3.6 ENERGY AND MINERAL RESOURCES

National Forest System lands are managed for recreation, timber harvesting, livestock grazing, oil and gas production, mining, wilderness protection and other purposes. In this section, energy and minerals resources are discussed, along with their association with geothermal resources.

On federal lands, mineral resources are governed by the General Mining Law of 1872, as amended; those portions of the FLPMA that affect the General Mining Law; and the Surface Resources Act of 1955 and The Mining and Minerals Policy Act of 1970. Oil, Gas leasing is guided by the Energy Policy Act of 2005. Geothermal leasing is guided by the Geothermal Steam Act of 1970 (30 USC 1004), as amended by the Energy Policy Act of 2005.

The Forest Service manages oil and gas operations on National Forest System lands under 36 CFR Subpart E. Mineral leasing operations are guided by Forest Service Manual 2820 and mineral prospecting, including geophysical activities is guided by Forest Service Manual 2860. Locatable minerals and surface management regulations fall under 36 CFR 228 Subpart A and Forest Service Manual 2810. Mineral materials are regulated under 36 CFR 228 Subpart C and Forest Service Manual 2850.

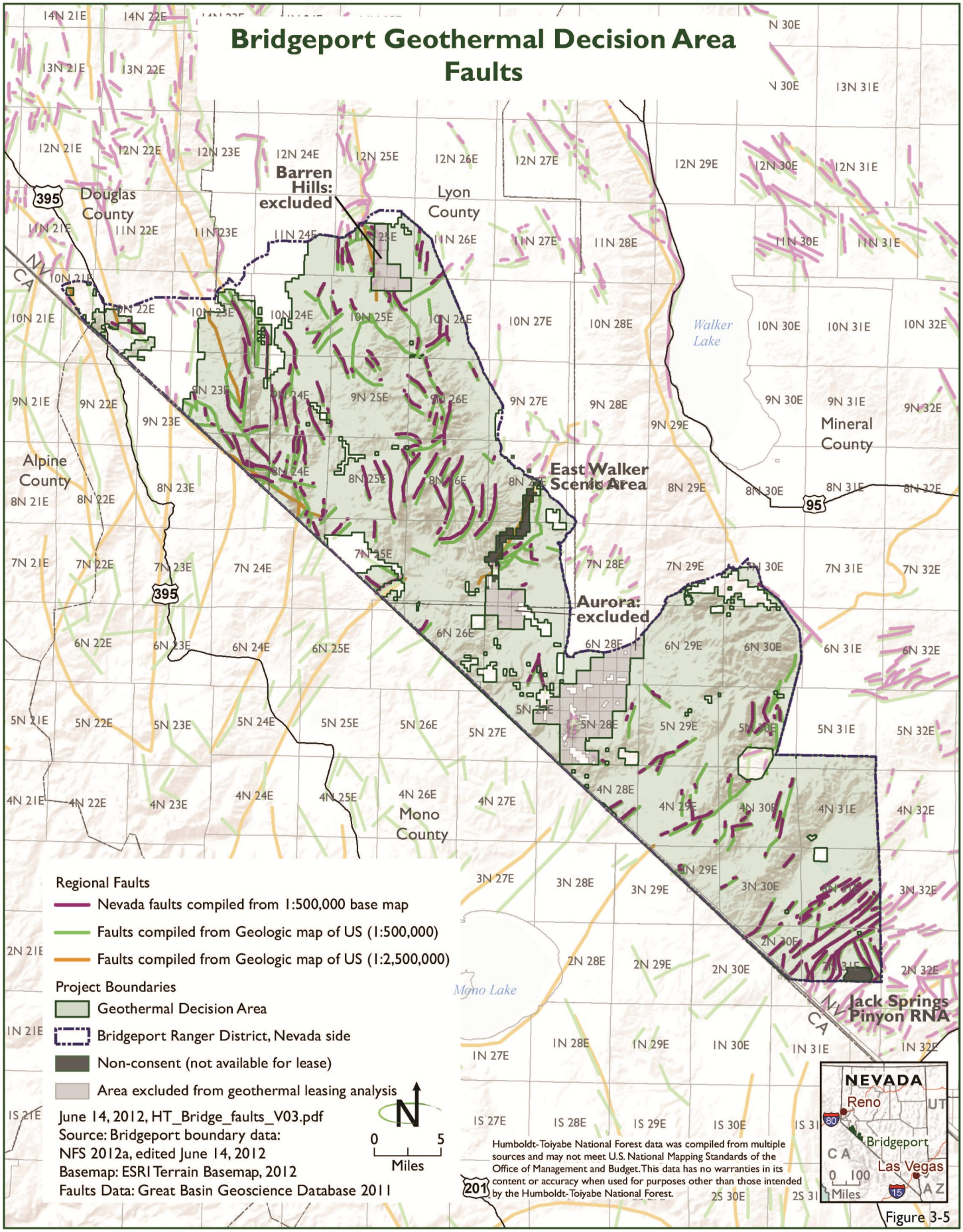
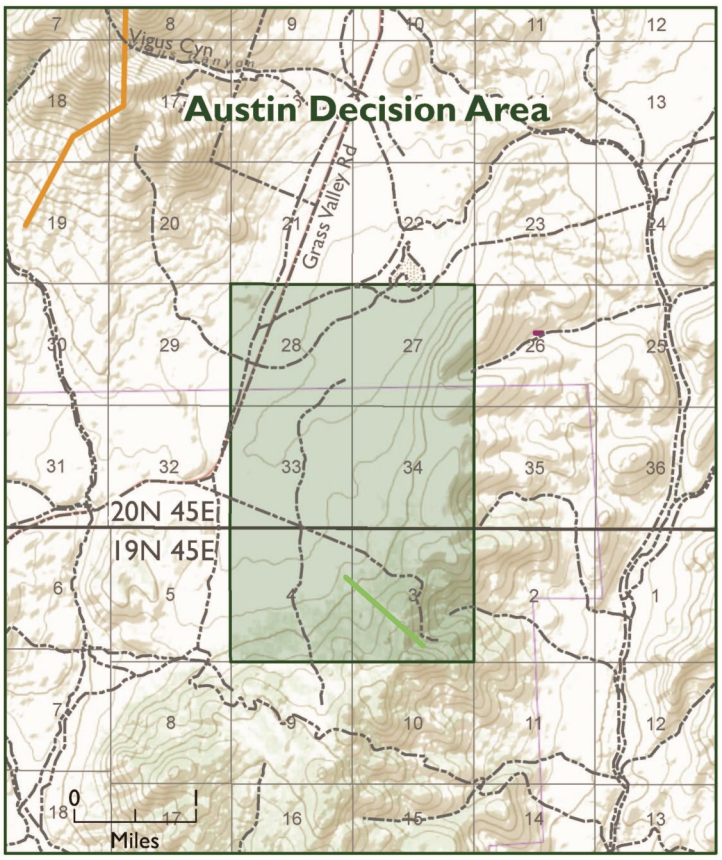
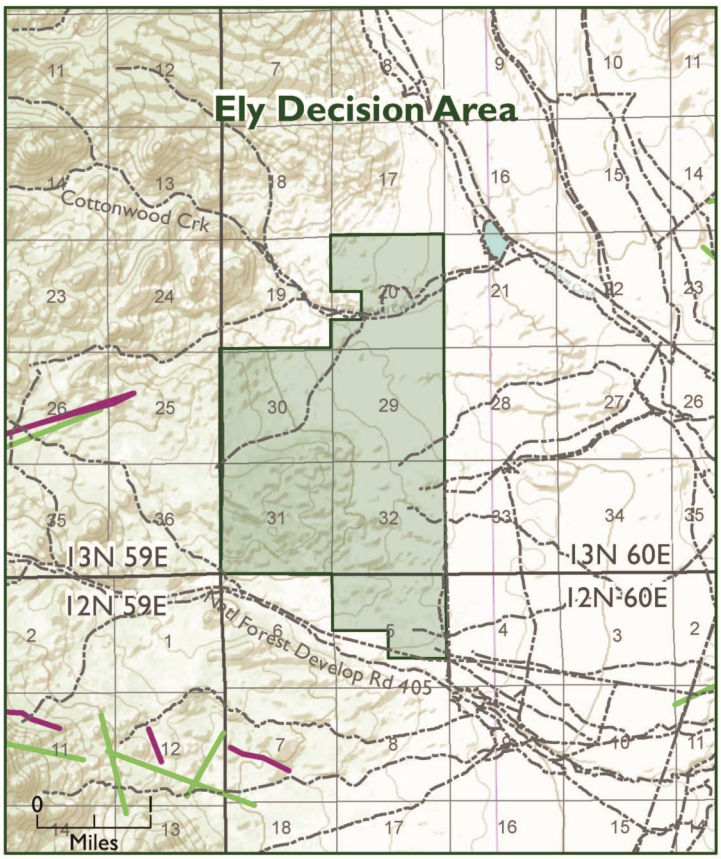
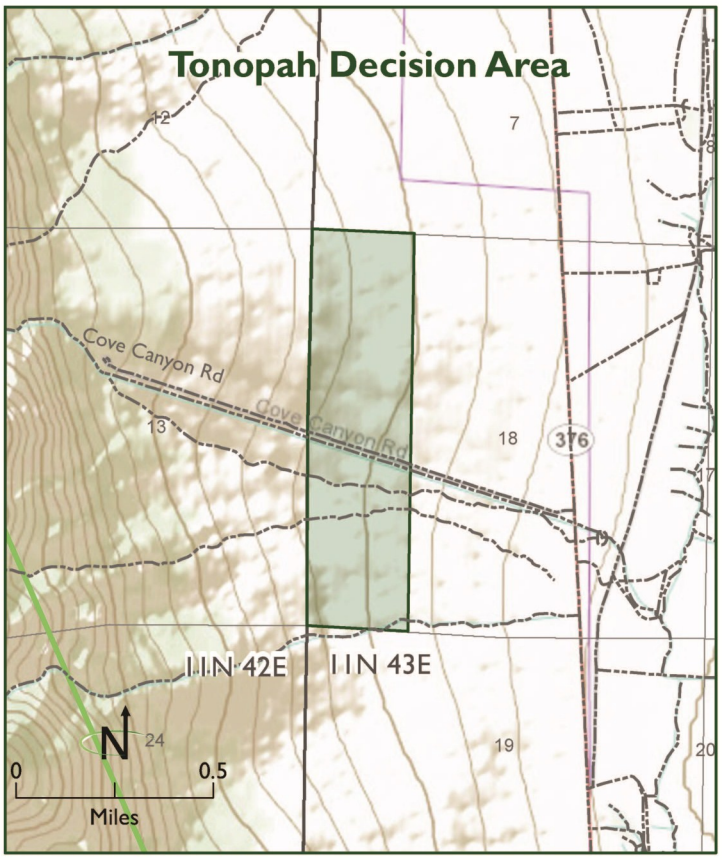

Bridgeport Geothermal Decision Area
Faults
Barren Hills: excluded
Douglas County
Lyon County
Mineral County
Alpine County
Mono County
East Walker Scenic Area
Aurora: excluded
Jack Springs Pinyon RNA
Walker Lake
Mono Lake
NV
CA
395
95
201
Regional Faults
Nevada faults compiled from 1:500,000 base map
Faults compiled from Geologic map of US (1:500,000)
Faults compiled from Geologic map of US (1:2,500,000)
Project Boundaries
Geothermal Decision Area
Bridgeport Ranger District, Nevada side
Non-consent (not available for lease)
Area excluded from geothermal leasing analysis
June 14, 2012, HT_Bridge_faults_V03.pdf
Source: Bridgeport boundary data:
NFS 2012a, edited June 14, 2012
Basemap: ESRI Terrain Basemap, 2012
Faults Data: Great Basin Geoscience Database 2011
0 5
Miles
Humboldt-Toiyabe National Forest data was compiled from multiple sources and may not meet U.S. National Mapping Standards of the Office of Management and Budget. This data has no warranties in its content or accuracy when used for purposes other than those intended by the Humboldt-Toiyabe National Forest.
NEVADA
Reno
Bridgeport
Las Vegas
CA
UT
AZ
0 100
Miles

Figure 3-5

Austin, Ely, Tonopah Geothermal Decision Areas
Faults







Geothermal Decision Area
Nevada faults compiled from 1:500,000 base map
Faults compiled from Geologic map of US (1:500,000)
Faults compiled from Geologic map of US (1:2,500,000)

June 14, 2012, HT_AET_faults_V03.pdf
Source - Austin, Ely, and Tonopah boundary data: NFS 2012a, edited June 14, 2012
Basemap: ESRI Terrain Basemap 2012
Faults Data: Great Basin Geoscience Database 2011

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Figure 3-6

Mineral Resources in Nevada and the Planning Area

The value of overall mineral and energy production in Nevada was $5.79 billion in 2009, roughly a drop of $470 million from the 2008 production value. Gold production has more or less steadily decreased from 1998 to 2009, but 2009 was nonetheless the 21st consecutive year with production in excess of 5.0 million ounces. Nevada led the nation in the production of gold and barite, and was the only state that produced magnesite, lithium, and the specialty clays sepiolite and saponite. Other commodities mined and produced in Nevada in 2009 included copper, construction aggregate (sand, gravel, and crushed stone, including limestone and dolomite), silver, geothermal energy, gypsum, petroleum, lime (produced from limestone and dolomite), cement (produced from limestone, clay, gypsum, and iron ore), silica (industrial sand), diatomite, clays, molybdenum, perlite, iron ore, dimension stone, salt, semiprecious gemstones (turquoise and opal), and mercury (as a byproduct of gold and silver processing) (Price 2010).

For the first time since 1999, Nevada ranked first in the US in terms of value of overall nonfuel (excluding oil, gas, coal, uranium, and geothermal) mineral production in 2009 (USGS 2010). Nevada's production of gold, valued at $4.9 billion, was 75 percent of the US total and helped make the US the third leading gold producer in the world in 2009. Nevada alone accounted for 7 percent of world production of gold (Price 2010). Second to gold in terms of Nevada's mineral value in 2009 was copper ($345 million), followed by construction aggregate ($175 million).

Locatable minerals have historically been a major source of industry in the regions around the proposed leasing areas. Minerals produced include copper, gold, silver, molybdenum, lithium, fluorspar, bentonite clay, diatomaceous earth, mercury, and turquoise (BLM and Forest Service 2008). Mining in the Humboldt-Toiyabe National Forest area is mainly associated with areas of historic gold and silver prospects, including the Reese River, Birch Creek, Big Creek, Kingston, Washington, Twin Rivers, and Jett mining districts (Forest Service 1986).

Energy Resources and Utilities in Nevada and the Planning Area

The local utility company that provides electricity is Sierra Pacific Power, a subsidiary of NV Energy. Sierra Pacific Power's total service territory covers approximately 50,000 square miles in northern Nevada and the Lake Tahoe area of northeastern California. Currently, Sierra Pacific Power meets energy demand of its customer base through generating power at company-owned power plants (approximately 2,800 megawatt) and purchasing energy in the market to meet excess demand. By 2015, Sierra Pacific Power expects that about 40 percent of their electricity will be produced using natural gas, 40 percent using coal and 20 percent from renewable energy. Currently, NV Energy subsidiaries get a portion of their power from 22 renewable energy sources, including geothermal, solar, hydro, and biofuel resources. Nevada's

2005 Renewable Portfolio Standards require that 20 percent of energy in the state be produced from alternative energy sources. Electrical power from geothermal energy production in Nevada in 2009 was valued at $111 million; its 17 percent increase in value resulted from a 21 percent increase in production (NV Energy 2011).

Oil is produced primarily in Railroad Valley in Nye County and Pine Valley in Eureka County. Total annual oil production from Nevada (valued at $21.8 million in 2009) is a minor part of US production. The amount of Nevada oil production increased slightly from 2008, although no new fields were discovered. Small amounts of co-produced natural gas are used to fuel equipment used for oil production. The value of Nevada oil production decreased from 2008 to 2009 as a result of lower oil prices (Price 2010).

According to the Nevada Division of Minerals, Nevada's oil production in 2009 was 454,593 barrels (0.023 percent of total US production), which was up 4 percent from 2008 and the highest since 2004. Oil production in 2008 saw the first increase since 1992. Production came from 65 actively producing wells in nine fields in Railroad Valley, Nye County, which accounted for 83 percent of the state's production, and six wells in one field in Pine Valley, Eureka County, which accounted for 17 percent (Davis 2010). Neither area is close to the four proposed leasing areas.

In 2005, the USGS released its assessment of undiscovered oil and gas resources of the Eastern Great Basin, an area that includes the eastern portion of Nevada, western Utah, and part of southeastern Idaho. The USGS estimated mean figures of 1.6 billion barrels of oil and 1.8 trillion cubic feet of natural gas remaining to be found in this region (USGS 2005).

3.6.1 Bridgeport Geothermal Decision Area

Minerals interest in the Bridgeport Geothermal Decision area include locatable, leasable and mineral materials, with locatable gold exploration and geothermal leasing/exploration making up the bulk of the projects on the District. There are currently about 25 active locatable minerals exploration and mining projects within the Decision Area. Geothermal exploration is underway at the Aurora and Barren Hills areas. These areas have been excluded from further analysis in this EIS; however, these projects are discussed in the detail in **Chapter 5**, Cumulative Impacts and Other Considerations. There is no oil or gas interest or exploration within or near the Bridgeport Geothermal Decision Area.

3.6.2 Austin Geothermal Decision Area

No mineral exploration or operations are located within the Austin Geothermal Decision Area. The BLM approved a geothermal development project at McGinness Hills to the north and adjacent to the decision area. This project is discussed in detail in Chapter 5. There is no oil or gas exploration within or near the decision area.

3.6.3 Ely Geothermal Decision Area

No minerals exploration or operations are located within the Ely Geothermal Decision Area. There is no oil or gas, or geothermal exploration within or near the decision area.

3.6.4 Tonopah Geothermal Decision Area

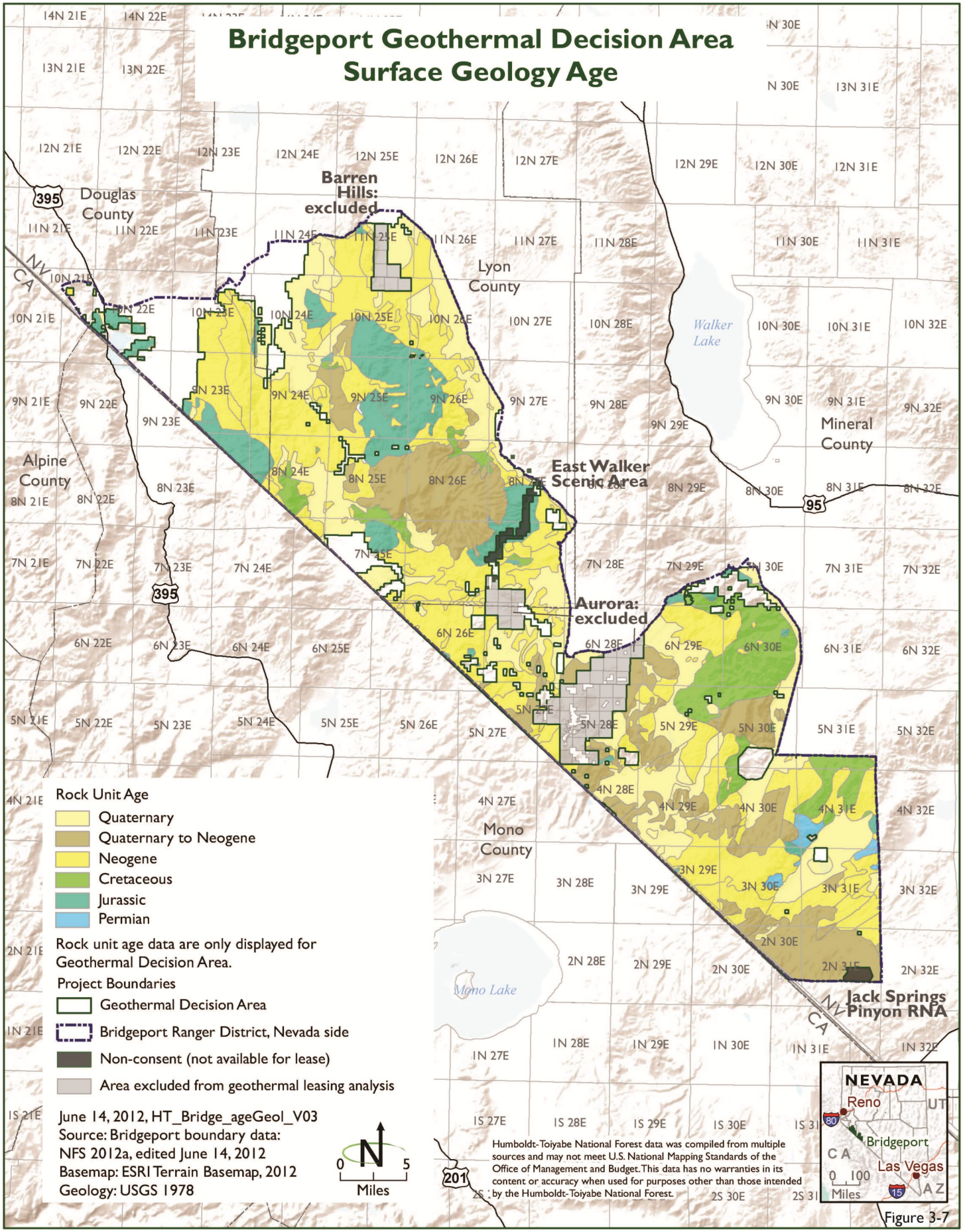
In the BLM Tonopah Resource Area, there are 65 mining districts with a history of operation and 15 large mines operating as of 1994. No minerals exploration or operations are located within the Tonopah Decision Area; however, BLM has identified the southwest quarter of section 18 as having moderate potential for locatable minerals (BLM 1994). In 2008, the Forest Service provided consent to geothermal leasing of the 440-acre parcel to the east of the decision area (Forest Service 2009). There is no oil or gas exploration within or near the decision area.

3.7 PALEONTOLOGICAL RESOURCES

Few Early Precambrian rocks are preserved in Nevada as a whole and none are indicated for the decision areas (see **Figures 3-7**, Bridgeport Ranger District Nevada Surface Geology Age, and **3-8**, Austin, Ely, Tonopah Geothermal Decision Areas Surface Geology Age). Fossils of blue-green bacteria in some Late Precambrian rocks in the southern and eastern part of the state indicate that shallow seas began to flood the edge of a quiet continental margin. Warm shallow seas gradually flooded the state during the early part of this time interval and continued to cover the southern and eastern part of the state through the Devonian, but the water deepened into an ocean basin to the northwest (The Paleontology Portal 2011).

Although Paleozoic rocks are well represented in Nevada there are few in the decision areas. Reef communities flourished in the shallower parts of the sea, while fossils of graptolites and other floating organisms are preserved in some of the deep-water deposits. An episode of mountain building (the Antler Orogeny) occurred toward the end of the Devonian and continued into the early part of the Carboniferous. By the Permian, sea level had dropped and parts of Nevada were dry land. Plant fossils can be found in rocks formed in shallow lagoons and beaches in the eastern part of the state, while scattered reefs still existed in the north and northeast (The Paleontology Portal 2011). Deep oceans persisted in the northwest, and the chert and shale from this time are rich in the fossils of plankton.

The Mesozoic was a time of changing sea level and intense tectonic activity. In the Triassic, the ocean continued to recede; however, deeper water persisted in the central and western parts of the state, and fossils of ichthyosaurs and ammonites are abundant. Rocks from the Jurassic indicate a deep-water environment limited to the northwest, a shallow marine environment in the central area, and non-marine environments to the south and east. Cretaceous


Bridgeport Geothermal Decision Area
Surface Geology Age
Barren Hills: excluded
Douglas County
Lyon County
Alpine County
Mineral County
Mono County
East Walker Scenic Area
Aurora: excluded
Jack Springs Pinyon RNA
Walker Lake
Mono Lake
NV
CA
395
95
201
Rock Unit Age
Quaternary
Quaternary to Neogene
Neogene
Cretaceous
Jurassic
Permian
Rock unit age data are only displayed for Geothermal Decision Area.
Project Boundaries
Geothermal Decision Area
Bridgeport Ranger District, Nevada side
Non-consent (not available for lease)
Area excluded from geothermal leasing analysis
June 14, 2012, HT_Bridge_ageGeol_V03
Source: Bridgeport boundary data: NFS 2012a, edited June 14, 2012
Basemap: ESRI Terrain Basemap, 2012
Geology: USGS 1978
N
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Miles
Humboldt-Toiyabe National Forest data was compiled from multiple sources and may not meet U.S. National Mapping Standards of the Office of Management and Budget. This data has no warranties in its content or accuracy when used for purposes other than those intended by the Humboldt-Toiyabe National Forest.
NEVADA
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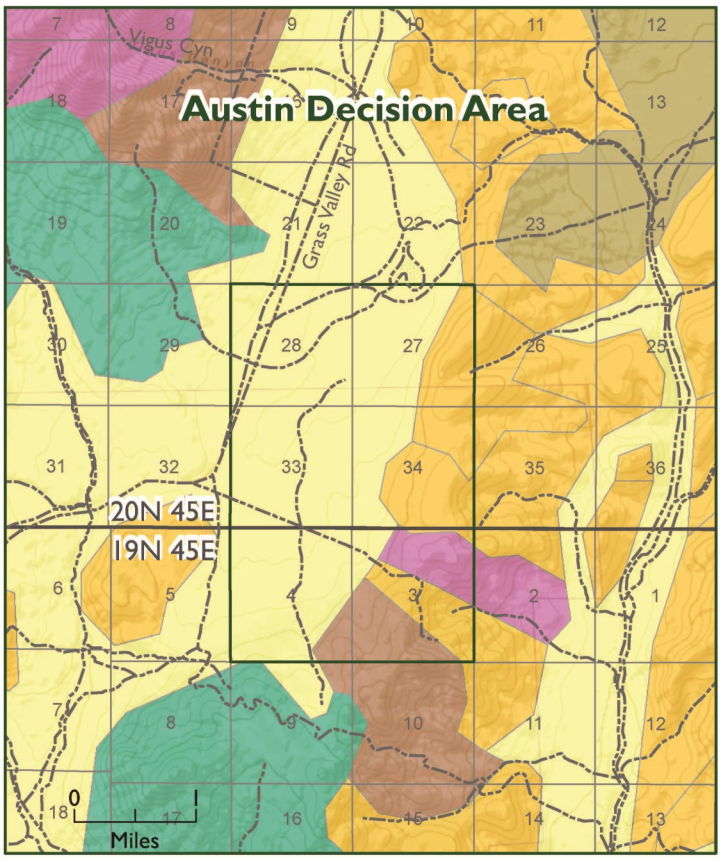
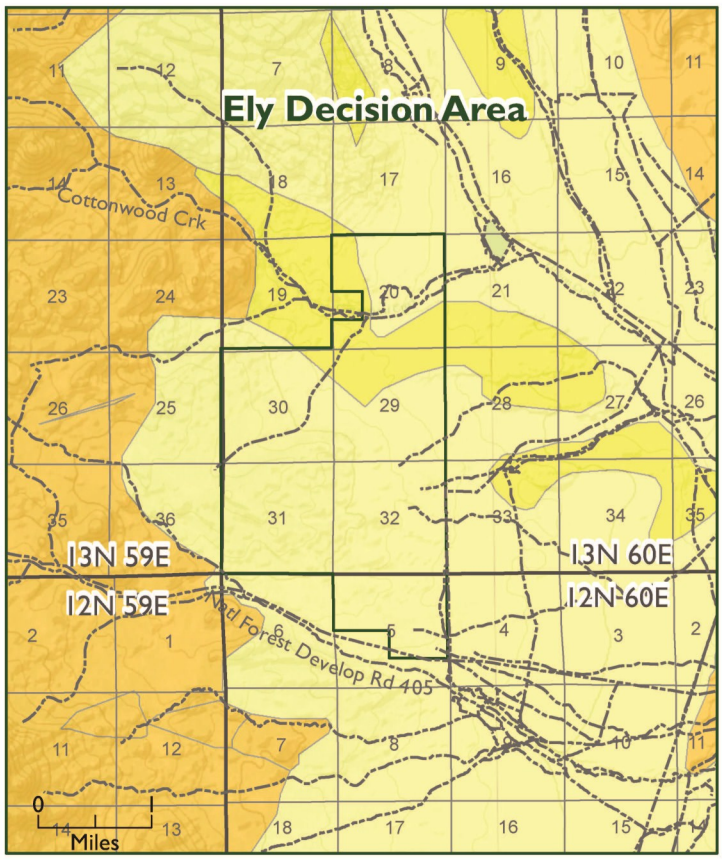
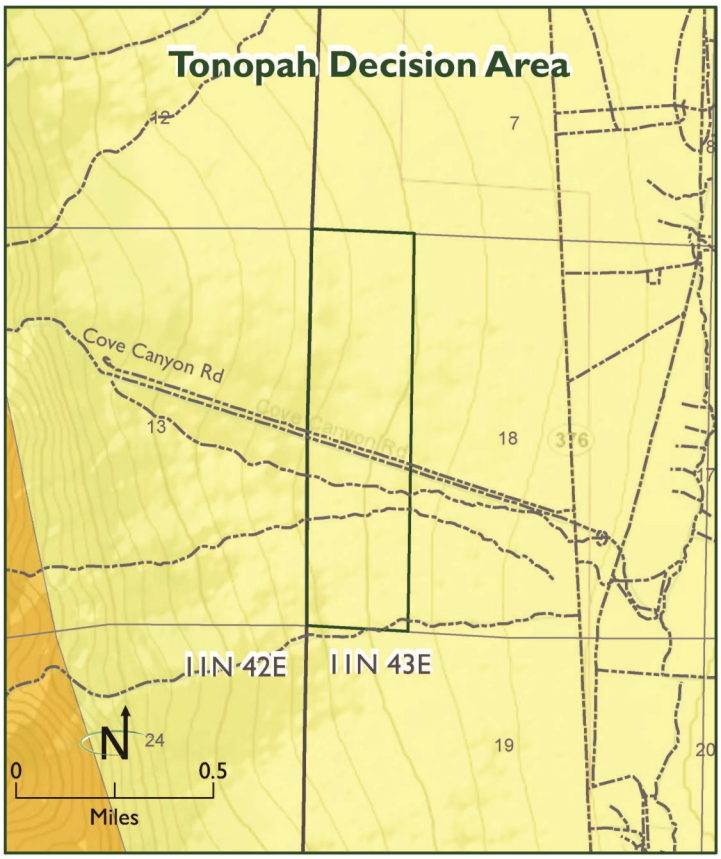
Figure 3-7

Austin, Ely, Tonopah Geothermal Decision Areas
Surface Geology Age







Geothermal Decision Area

Rock Unit Age
- Quaternary
- Quaternary to Neogene
- Neogene
- Paleogene
- Jurassic
- Devonian
- Ordovician to Devonian

June 14, 2012, HT_AET_ageGeol_V03
Sources - Austin, Ely, and Tonopah boundary data: NFS 2012a, edited June 14, 2012
Basemap: ESRI Terrain Basemap 2012
Geology: USGS 1978

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Figure 3-8

rocks are rare in Nevada, but they indicate that a volcanic island arc formed along the western edge of the state. Scattered twigs believed to be from Sequoia trees are reported from Eureka County are the only known Cretaceous fossils from the state (The Paleontology Portal 2011).

During the Early Cenozoic (Tertiary), tectonic activity was intense and blocks of crust rose to form mountains, while others dropped to form basins, initiating the Basin and Range Province we see today. Mammoths, rhinos, and horses roamed through woodlands populated with oak, redwood, and willow. Volcanic eruptions were frequent. During the Late Cenozoic (Quaternary), the Sierra Nevada Mountains were uplifted, and glaciers sculpted the highest peaks. Mammoths, horses, camels, and giant ground sloths roamed freely. Volcanic eruptions continued throughout the state, depositing ash flows and lava (The Paleontology Portal 2011). The Cenozoic is by far the most extensive surface geology in the planning area.

The Potential Fossil Yield Classification system is used to classify paleontological resource potential on public lands. The following summary outlines the general definitions of the Potential Fossil Yield Classification.

Class 1 – Very Low. This class identifies geologic units that are not likely to contain recognizable fossil remains.

- Units that are identified as igneous or metamorphic, excluding reworked volcanic ash units.
- Units that are Precambrian in age or older.

The probability for impacting any fossils in Class 1 areas is negligible. The occurrence of significant fossils is non-existent or extremely rare.

Class 2 – Low. This class identifies sedimentary geologic units that are not likely to contain vertebrate fossils or scientifically significant nonvertebrate fossils.

- Vertebrate or significant invertebrate or plant fossils not present or very rare.
- Units that are generally younger than 10,000 years before present.
- Recent aeolian deposits.
- Sediments that exhibit significant physical and chemical changes (i.e., diagenetic alteration).

The probability for impacting vertebrate fossils or scientifically significant invertebrate or plant fossils is low. Localities containing important resources may exist but would be rare and would not influence the classification.

Class 3 – Moderate or Unknown. This class identifies fossiliferous sedimentary geologic units where fossil content varies in significance, abundance, and predictable occurrence, or sedimentary units of unknown fossil potential.

- Often marine in origin with sporadic known occurrences of vertebrate fossils.
- Vertebrate fossils and scientifically significant invertebrate or plant fossils known to occur intermittently; predictability known to be low.
- Poorly studied and/or poorly documented. Potential yield cannot be assigned without ground reconnaissance.

Class 3a – Moderate Potential. This class identifies units that are known to contain vertebrate fossils or scientifically significant nonvertebrate fossils, but these occurrences are widely scattered. Common invertebrate or plant fossils may be found in the area, and opportunities may exist for hobby collecting. The potential for a project to be sited on or impact a significant fossil locality is low, but the potential is somewhat higher for common fossils.

Class 3b – Unknown Potential. This class identifies units that exhibit geologic features and preservational conditions that suggest significant fossils could be present, but little information about the paleontological resources of the unit or the area is known. This may indicate the unit or area is poorly studied, and field surveys may uncover significant finds. The units in this class may eventually be placed in another class when sufficient survey and research is performed.

Class 4 – High. This class identifies geologic units containing a high occurrence of significant fossils. Vertebrate fossils or scientifically significant invertebrate or plant fossils are known to occur and have been documented, but may vary in occurrence and predictability. Surface disturbing activities may adversely affect paleontological resources in many cases.

Class 5 – Very High. This class identifies highly fossiliferous geologic units that consistently and predictably produce vertebrate fossils or scientifically significant invertebrate or plant fossils, and that are at risk of human-caused adverse impacts or natural degradation.

3.7.1 Bridgeport Geothermal Decision Area

The Bridgeport Geothermal Decision Area has about 4,170 acres of Permian deposits covering 1 percent of the decision area; approximately 60,880 acres (10 percent) of Jurassic age deposits and about 50,000 acres (8 percent) of Cretaceous age deposits; and approximately 354,970 acres (58 percent) of Tertiary age deposits and 134,597 acres (22 percent) of Quaternary age deposits.

The northeast corner of the Bridgeport Ranger District near Wilson Canyon is the only area where fossil remains have been noted with any frequency. The fluvio-lacustrine (river and lake) deposits of the Early to Middle Pliocene Coal Valley Formation of the Wassuk Group found here contain vertebrate fossils of mainly modern faunal forms, (e.g. horse, pig, camel, etc.) The area has also given up more exotic faunal forms such as a gomphothere, a cousin of mastodons and ancestor of modern elephants, and indications of big prehistoric cats and bear dogs. Vertebrate fossil collection may only be carried out by scientific and educational entities through a special use permit on National Forest System lands. Individual fossil collection of vertebrate fossils are prohibited [36 CFR 251.53 (a) and (f)].

3.7.2 Austin Geothermal Decision Area

The Austin Geothermal Decision Area has approximately 476 acres (12 percent) of the Austin Geothermal Decision Area, of Ordovician through Devonian period surface geology, generally located in the southeast quadrant, and approximately 847 acres (21 percent) of Tertiary and 2,630 acres (66 percent) of Quaternary deposits.

3.7.3 Ely Geothermal Decision Area

The Ely Geothermal Decision Area has approximately 482 acres (14 percent) of Tertiary and 3050 acres (86 percent) of Quaternary deposits. There are no known fossiliferous formations in the Tertiary and Quaternary deposits within the Ely Geothermal Decision Area.

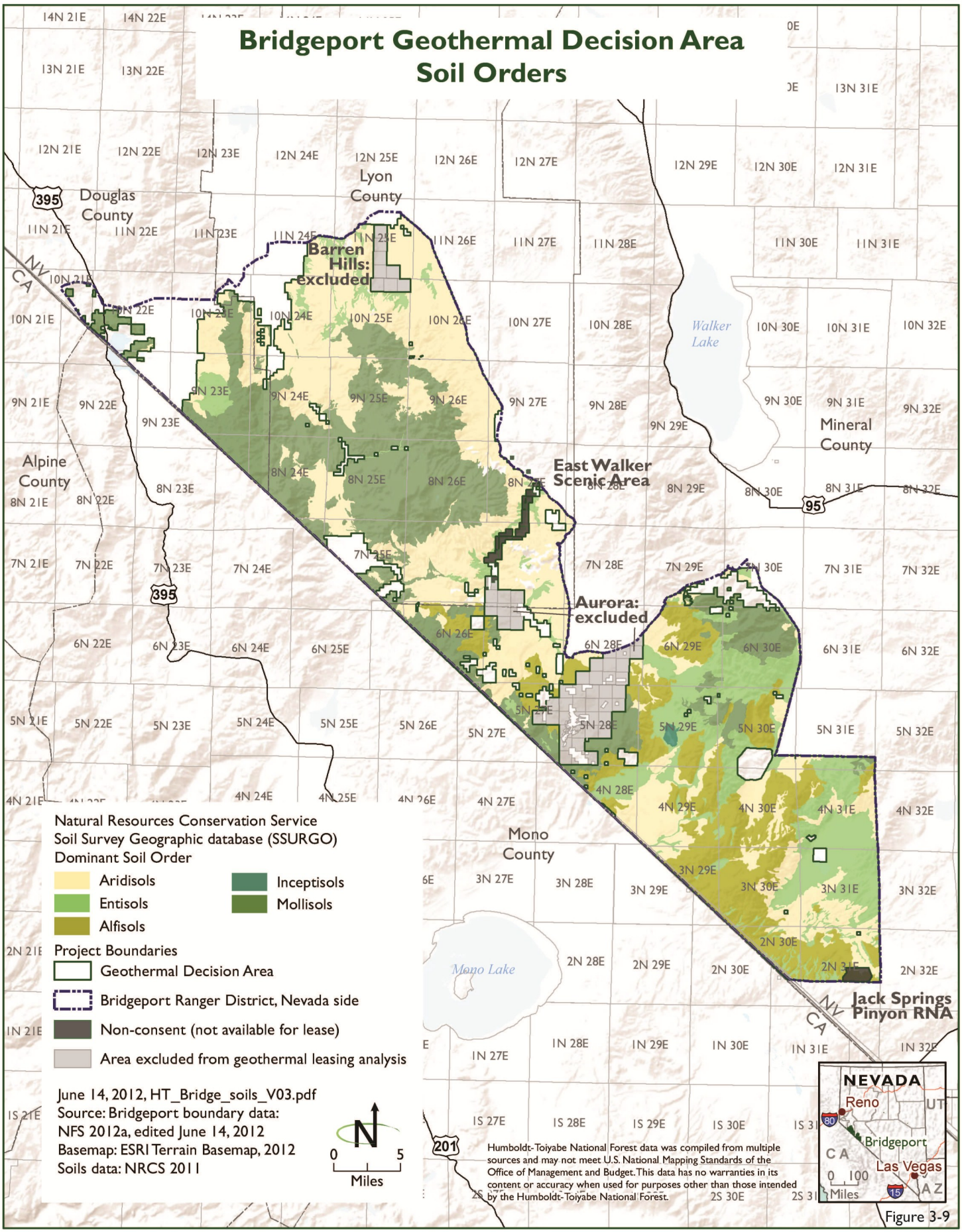
3.7.4 Tonopah Geothermal Decision Area

The Tonopah Geothermal Decision Area is unique for having 100 percent Quaternary age deposits.

3.8 SOIL RESOURCES

Soils in the planning area range from sandy loam and clay loam to rock outcrop. Soils are the result of complex interactions between parent material (geology), climate, topography, organisms, and time. Soils are classified by the degree of development in distinct layers or horizons and prevailing physical and chemical properties. Similar soil types are grouped together into soil orders based on defining characteristics, such as organic matter and clay content, amount of mineral weathering, water and temperature regimes, or other characteristics that give soil unique properties, such as the presence of volcanic ash or permafrost (BLM 2007a). The following soil orders are found in the Bridgeport Decision Area (see **Figure 3-9**, Bridgeport Geothermal Decision Area Soil Orders).

Aridisols occur across wide parts of the western US in Nevada, Arizona, New Mexico, central Wyoming, southern Idaho, and southern California. These soils are characterized by a very dry climate with minimal available water to plants. They are light colored, low in organic matter, and may have subsurface


Bridgeport Geothermal Decision Area
Soil Orders
Douglas County
Lyon County
Mineral County
Alpine County
Mono County
Barren Hills: excluded
East Walker Scenic Area
Aurora: excluded
Jack Springs Pinyon RNA
Walker Lake
Mono Lake
NV
CA
395
95
201
Natural Resources Conservation Service
Soil Survey Geographic database (SSURGO)
Dominant Soil Order
Aridisols
Entisols
Alfisols
Inceptisols
Mollisols
Project Boundaries
Geothermal Decision Area
Bridgeport Ranger District, Nevada side
Non-consent (not available for lease)
Area excluded from geothermal leasing analysis
June 14, 2012, HT_Bridge_soils_V03.pdf
Source: Bridgeport boundary data:
NFS 2012a, edited June 14, 2012
Basemap: ESRI Terrain Basemap, 2012
Soils data: NRCS 2011
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Miles
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Bridgeport
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Las Vegas
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0 100
Miles

Figure 3-9

accumulations of soluble materials, such as calcium carbonate, silica, gypsum, soluble salts, and exchangeable sodium. Accumulation of these soluble materials can result in hard pans (e.g., petrocalcic, petrogypsic, and duripans) close to the surface resulting in shallow rooting depths to plants and difficult in excavation. Vegetation on these soils includes desert shrubs and short bunchgrasses, which are important resources for livestock, game animals, and other ungulates. Aridisols are generally not very productive without irrigation and may be prone to salinity buildup. Surface mineral deposits often form physical crusts that impede water infiltration (BLM 2007a).

Entisols are young, weakly developed mineral soils that lack significant profile development (soil horizons). They are often found in lower-elevation, arid, and semiarid environments supporting desert shrub and sagebrush communities. Entisols can include recent alluvium, sands, soils on steep slopes, and shallow soils. Soil productivity ranges from very low in soils forming in shifting sand or on steep rocky slopes to very high in certain soils formed in recent alluvium. Productivity is often limited by shallow soil depth, low water-holding capacity, or inadequate available moisture. However, these soils support rangeland vegetation and may support trees in areas of higher precipitation.

Mollisols typically support grasslands and are mineral soils with thick, dark-colored surface horizons rich in organic matter from the dense root systems of prairie grasses. They are one of the most productive soils on public lands, and their high organic matter content helps reduce the risk of groundwater contamination by herbicides. Mollisols extend from upland areas to the prairie grasslands, where they are most abundant. Mollisols support a variety of plant communities, including grasslands, chaparral-mountain shrub, and forests. Since they have developed primarily under grassland vegetation, mollisols have been used extensively for livestock grazing (BLM 2007a).

Alfisols are moderately leached soils that have relatively high native fertility. These soils have mainly formed under forest and have a subsurface horizon in which clays have accumulated. Alfisols are primarily found in temperate humid and subhumid regions of the world. In the US, alfisols account for approximately 13.9 percent of the land area. The combination of generally favorable climate and high native fertility allows Alfisols to be very productive soils for both agricultural and silvicultural use (University of Idaho 2011).

Inceptisols are generally young mineral soils but have had more time to develop profile characteristics than Entisols. They principally occur in very cool to warm, humid and subhumid regions and in most physiographic conditions, and often support coniferous and deciduous forests, as well as rangeland. They may form in resistant rock or thin volcanic ash on steep mountain slopes or depressions, on top of the mountain peaks, or next to rivers. Productivity is varied and may be high where moisture is adequate (BLM 2007a).

Soil erosion is a concern throughout the planning area, particularly in semiarid rangelands. The quantity of soil lost by water or wind erosion is influenced by climate, topography, soil properties, vegetation cover, and land use. While erosion occurs under natural conditions, rates of soil loss may be accelerated by human activities (BLM 2007a).

Soil data for all National Forest System lands in the study areas has not been mapped by the Natural Resources Conservation Service (NRCS). The soil data discussed below is based on the information available on the State Soil Geographic Database.

3.8.1 Bridgeport Geothermal Decision Area

Soil Description

Soil orders found in the Bridgeport Geothermal Decision Area include Aridisols, Entisols, Mollisols, Alfisols, and Inceptisols. There are over numerous soil types occurring in the Bridgeport Decision Area, including rock outcrop, stony sandy loam, clay loam with saline alkali, sand, fine sandy loam, and gravelly loam. The soils range from well-drained to somewhat poorly drained soils.

Soil Erosion

The potential for erosion from wind and water within the Bridgeport Geothermal Decision Area is low to high. Moderate and high erosion potential corresponds with soils on steeper slopes.

3.8.2 Austin Geothermal Decision Area

Soil Description

Soils associations within the Austin Geothermal Decision Area include approximately 60 percent Zaidy-Oxcorel-Grassval (s5769) and forty percent Simpark-Punchbowl-Akerue (s5774). These soils are found on slopes between 2 and 50 percent and are well drained. Runoff and permeability of these soils ranges from slow to rapid runoff and very slow to moderate permeability (NRCS 2010).

Soil Erosion

The potential for erosion from wind and water within Austin Geothermal Decision Area is low to moderate. Moderate erosion potential corresponds with soils on steeper slopes.

3.8.3 Ely Geothermal Decision Area

Soil Description

Soils association within the Ely Geothermal Decision Area includes Zadvar-Umil-Nuc-Lien-Fenster-Coils (s5426). This soil association is an Aridisol. Soils in this association are found at slopes between 2 and 50 percent, are well drained

and vary from medium to moderately high runoff and moderately slow to medium permeability.

Soil Erosion

The potential for erosion from wind and water within the Ely Geothermal Decision Area is low to moderate. Moderate erosion potential corresponds with soils on steeper slopes.

3.8.4 Tonopah Geothermal Decision Area

Soil Description

Soils association within the Tonopah Geothermal Decision Area includes Wardenot-Laxal-Izo (s5861). These soils are Aridisols. Soils in this association are found at slopes between 0 and 30 percent, range from somewhat excessively drained to excessively drained, very slow to medium runoff and moderate to rapid permeability.

Soil Erosion

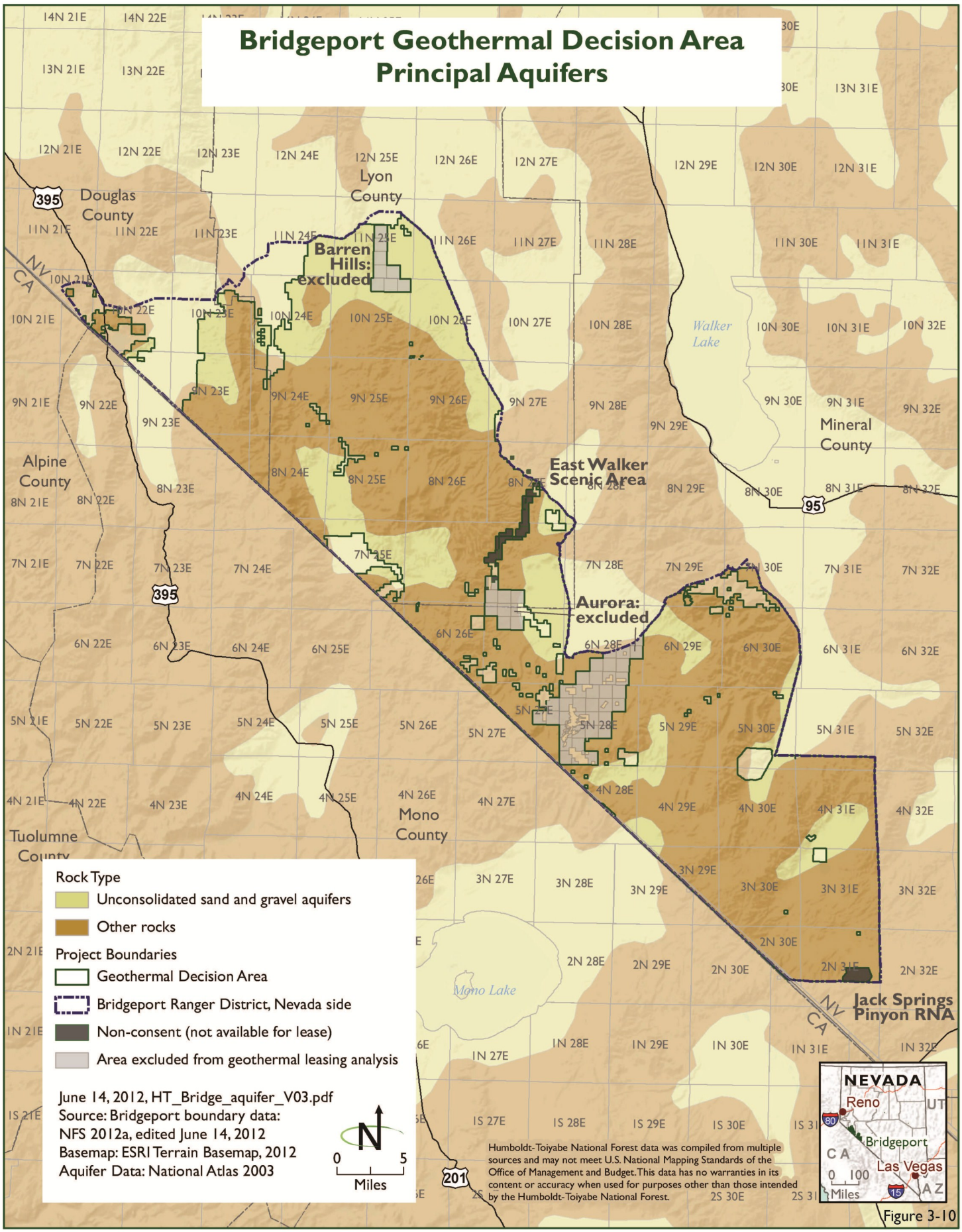
The potential for erosion from wind and water within the Tonopah Geothermal Decision Area is low to moderate. Moderate erosion potential corresponds with soils on steeper slopes.

3.9 WATER RESOURCES (SURFACE AND GROUND)

This section includes a description of the regulations that protect water resources on public land in the planning area. The Great Basin Hydrologic Region includes the Great Basin and encompasses nearly the entire state of Nevada, as well as western Utah (BLM 2007a). This region encompasses the Basin and Range basin-filled aquifers and carbonate rock aquifers, the southern Nevada volcanic rock aquifers, and a minor amount of the Colorado Plateau aquifers (USGS 2002). The hydrologic characteristics of the four decision areas are discussed below. Groundwater is described for the region as a whole, while surface water is described for the region and the four decision areas.

Groundwater

The decision areas lie in the Basin and Range aquifer system, the principal aquifer system of eastern Nevada, western Utah, and southeastern Idaho (see **Figures 3-10**, Bridgeport Geothermal Decision Area Principal Aquifers, and **3-11**, Austin, Ely, Tonopah Geothermal Decision Areas Principal Aquifers). The region is characterized by northerly trending mountain ranges and intermountain valleys with closed drainage. The water-yielding materials in the Basin and Range aquifers are in valleys and basins, consisting primarily of unconsolidated alluvial-fan deposits. Local floodplain and lacustrine (lake) beach deposits may also yield water to wells. The consolidated volcanic and carbonate rocks that underlie the unconsolidated alluvium are a water source if the consolidated rocks are sufficiently fractured or have solution openings. Many of these valleys and basins are internally drained where water from precipitation


Bridgeport Geothermal Decision Area
Principal Aquifers
Douglas County
Lyon County
Barren Hills: excluded
Alpine County
East Walker Scenic Area
Mineral County
Aurora: excluded
Mono County
Tuolumne County
Walker Lake
Mono Lake
Jack Springs Pinyon RNA
NV
CA
395
95
201
Rock Type
Unconsolidated sand and gravel aquifers
Other rocks
Project Boundaries
Geothermal Decision Area
Bridgeport Ranger District, Nevada side
Non-consent (not available for lease)
Area excluded from geothermal leasing analysis
June 14, 2012, HT_Bridge_aquifer_V03.pdf
Source: Bridgeport boundary data: NFS 2012a, edited June 14, 2012
Basemap: ESRI Terrain Basemap, 2012
Aquifer Data: National Atlas 2003
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Miles
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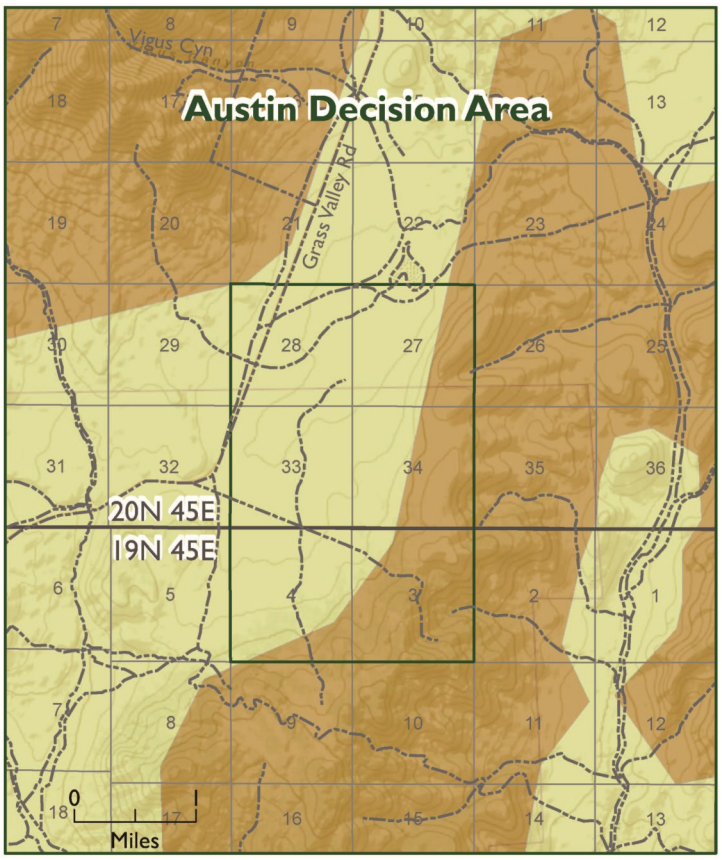
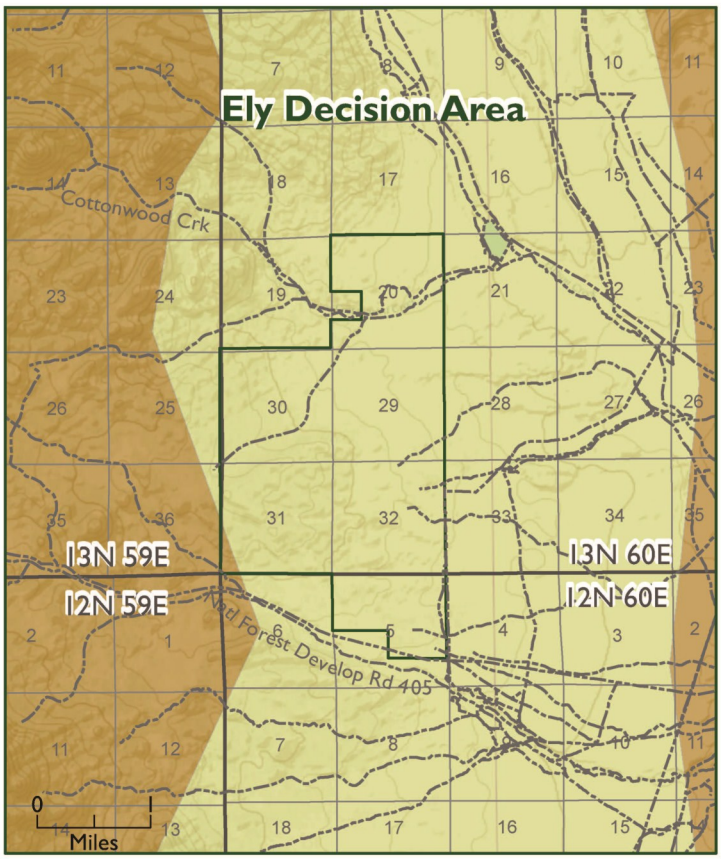
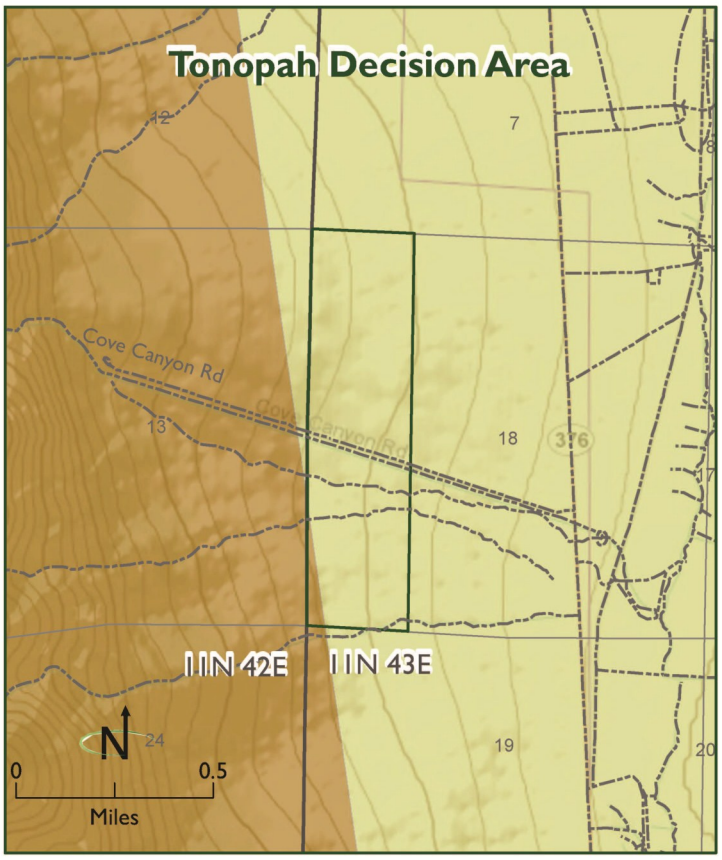
Miles

Figure 3-10

Austin, Ely, Tonopah Geothermal Decision Areas
Principal Aquifers







Geothermal Decision Area

Rock Type

Unconsolidated sand and gravel aquifers

Other rocks

June 14, 2012, HT_AET_aquifers_V03.pdf
Sources - Austin, Ely, and Tonopah boundary data: NFS 2012a, edited June 14, 2012
Basemap: ESRI Terrain Basemap 2012
Aquifer Data: National Atlas 2003

Humboldt-Toiyabe National Forest data was compiled from multiple sources and may not meet U.S. National Mapping Standards of the Office of Management and Budget. This data has no warranties in its content or accuracy when used for purposes other than those intended by the Humboldt-Toiyabe National Forest.

Figure 3-11

that falls within the basin recharges the aquifer and ultimately evaporates within the basin. Rarely, basins might be hydraulically connected in the subsurface by fractures or solution opening in the underlying bedrock. Also, several basins or valleys may develop surface water drainage that hydraulically connects the basins, and groundwater flows between the basins, mostly through the unconsolidated alluvial stream/floodplain sediments (USGS 2002). Within the Basin and Range Province, aquifers are not continuous, or regional, because of the complex faulting in the region. Three principal aquifer types are collectively called the Basin and Range aquifers: volcanic-rock aquifers, carbonate-rock aquifers, and basin-fill aquifers. The volcanic-rock aquifers, located in south-central Nevada, are primarily tuff, rhyolite, or basalt of Tertiary age. The carbonate-rock aquifers, which are primarily limestones and dolomites of Mesozoic and Paleozoic age, underlie many of the alluvial basins in eastern Nevada, western Utah and southeastern Idaho. Conditions indicate that the carbonate rock is cavernous. The basin-fill aquifers are primarily unconsolidated sand and gravel of Quaternary and Tertiary age. The most permeable basin-fill deposits are present in the depressions created by the late Tertiary to Quaternary block faulting and can be classified by origin as alluvial-fan, lake-bed, or fluvial deposits. Any or all three aquifer types may be in or underlie a particular basin and constitute three separate sources of water; however, the aquifers may be hydraulically connected to form one single source. Other rock types within the region have low permeability and act as boundaries to the flow of fresh groundwater (USGS 2002). The groundwater beneath the decision areas occurs in unconsolidated sand and gravel aquifers.

Groundwater recharge primarily originates as precipitation in the mountain areas surrounding the basins, while most precipitation that falls in the valleys is lost to evaporation and transpiration. Aquifers in the area are recharged by snowmelt runoff from higher elevations of the surrounding mountain ranges. Return flow of irrigated water and seepage along stream valleys are also important sources of recharge.

Groundwater Quality

Nevada has a state program to protect groundwater quality. The Bureau of Water Pollution Control issues ground water permits (NEV permits) for activities like surface disposal, septic systems, mound septic systems, unlined ponds, overland flow, reuse and irrigation. "Zero discharge permits" are also issued in cases where a potential to discharge exists, e.g. lined ponds and tanks. Proposed projects are evaluated to ensure that the background groundwater quality is not degraded or that drinking water quality standards are not violated. The Bureau of Water Pollution Control views all groundwater as potential drinking water (NDEP 2011).

The Nevada Division of Environmental Protection regulates groundwater quality under the National Pollution Discharge Prevention System. Groundwater quality for the decision areas is not known.

The dissolved solids concentrations in the water in the basin-fill aquifers are generally less than 1,000 milligrams per liter but exceed 10,000 milligrams per liter in the Great Salt Lake Desert near the Great Salt Lake (EPA 2008).

Water Use and Water Rights

Groundwater and surface water rights are not discussed in this section. Water rights are specific to individual locations, aquifers, landowners, and local jurisdictions. Geothermal developers must obtain the appropriate water rights and state permits, in addition to the federal lease for the resource.

Groundwater basins are "designated" by the Nevada State Engineer, Department of Conservation and Natural Resources, Division of Water Resources when permitted groundwater rights approach or exceed the estimated average annual recharge and the water resources are being depleted or require additional administration.

Surface Water

The Great Basin Hydrologic Region of Nevada and Utah is an arid region located in the rain-shadow of the Sierra Nevada Mountains (See **Figures 3-12**, Bridgeport Geothermal Decision Area Surface Water Features, and **3-13**, Austin, Ely, Tonopah Geothermal Decision Areas Surface Water Features). The region is characterized by northerly trending mountain ranges and intermountain valleys with closed drainage. None of the streams that originate within this basin have an outlet to the ocean. The Great Basin's internal drainage, which covers 200,000 square miles including most of Nevada, and portions of Utah, Idaho, California, and Oregon, results from blockage of water movement by high fault-created mountains and lack of sufficient water flow to merge with larger drainages outside of the Great Basin (USGS and NPS 2000).

The region's surface water sources evaporate or percolate before they can flow to the ocean. Precipitation generally falls as rain or mountain snowfall. Streams flowing from the mountains carry water to the basins, which infiltrates into alluvial sediments and provides the only substantial recharge to basin groundwater. Surface water flow in the basins is derived almost entirely from the mountain streams. Any water that falls as rain or snow into this region does not leave (USGS and NPS 2000).

The planning area is subject to Section 404 of the Clean Water Act (CWA) and is implemented by the Corps of Engineers. Section 404 of the CWA regulates the discharge of dredged or fill material into surface waters such as navigable and interstate waters and their tributaries, wetlands adjacent to those waters and all impoundments of those waters. The US Environmental Protection Agency (EPA) has delegated to the state of Nevada the responsibility for regulating the quality of water within its borders.

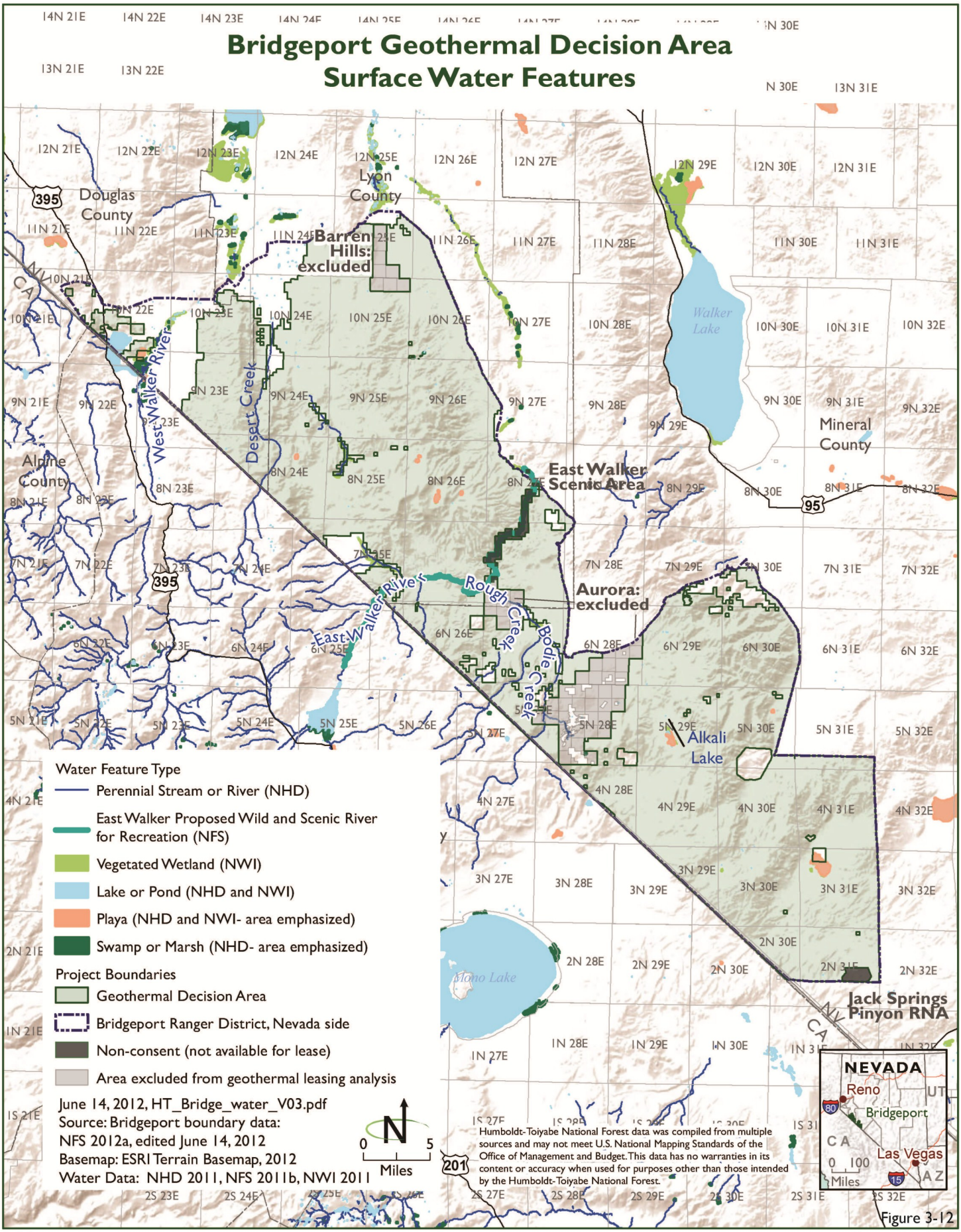
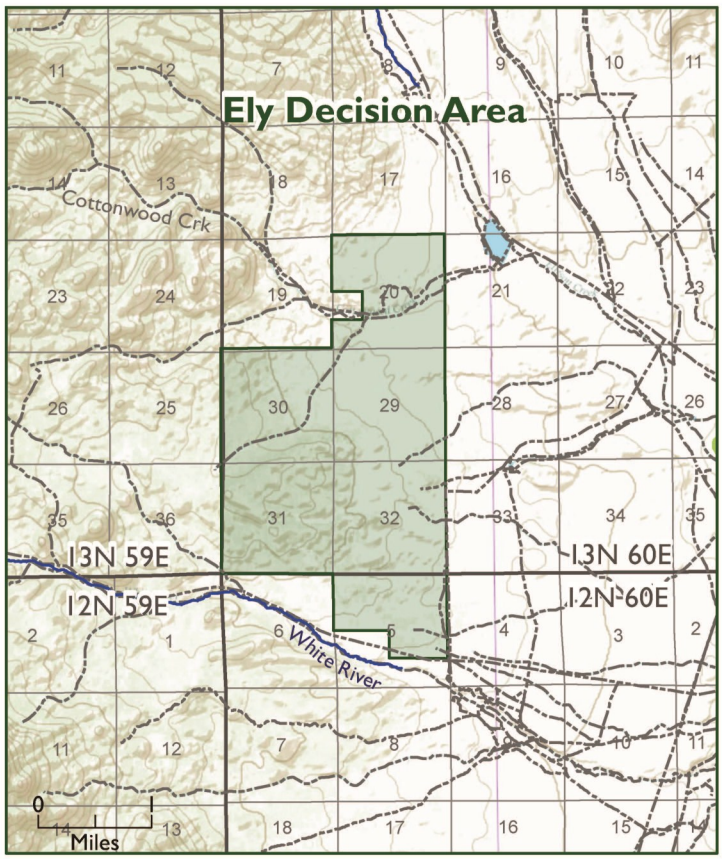
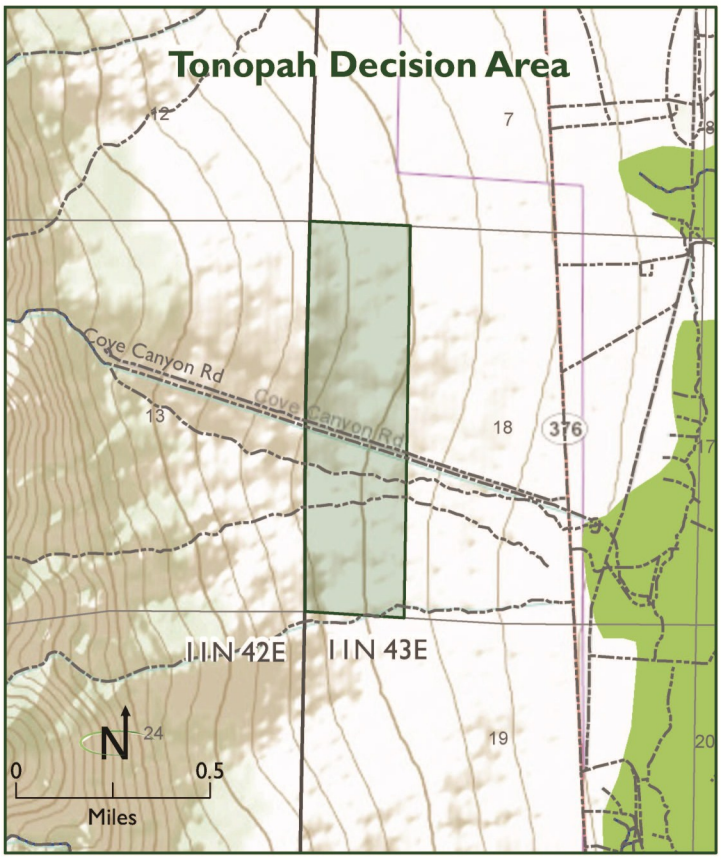

Bridgeport Geothermal Decision Area
Surface Water Features
Douglas County
Lyon County
Mineral County
Alpine County
Barren Hills: excluded
East Walker Scenic Area
Aurora: excluded
Walker Lake
Mono Lake
Alkali Lake
West Walker River
Desert Creek
East Walker River
Rough Creek
Boble Creek
Jack Springs Pinyon RNA
NEVADA
Reno
Bridgeport
Las Vegas
Water Feature Type
Perennial Stream or River (NHD)
East Walker Proposed Wild and Scenic River for Recreation (NFS)
Vegetated Wetland (NWI)
Lake or Pond (NHD and NWI)
Playa (NHD and NWI- area emphasized)
Swamp or Marsh (NHD- area emphasized)
Project Boundaries
Geothermal Decision Area
Bridgeport Ranger District, Nevada side
Non-consent (not available for lease)
Area excluded from geothermal leasing analysis
June 14, 2012, HT_Bridge_water_V03.pdf
Source: Bridgeport boundary data: NFS 2012a, edited June 14, 2012
Basemap: ESRI Terrain Basemap, 2012
Water Data: NHD 2011, NFS 2011b, NWI 2011
0 5 Miles
Humboldt-Toiyabe National Forest data was compiled from multiple sources and may not meet U.S. National Mapping Standards of the Office of Management and Budget. This data has no warranties in its content or accuracy when used for purposes other than those intended by the Humboldt-Toiyabe National Forest.

Figure 3-12

Austin, Ely, Tonopah Geothermal Decision Areas
Surface Water Features





Geothermal Decision Area

Water Feature Type

Perennial Stream or River (NHD)

National Wetland Inventory

Playa

Vegetated

Water

June 14, 2012, HT_AET_water_V03.pdf
Source - Austin, Ely, and Tonopah boundary data: NFS 2012a, edited June 14, 2012
Basemap: ESRI Terrain Basemap 2012
Water Data: NHD 2011, NWI 2011

Humboldt-Toiyabe National Forest data was compiled from multiple sources and may not meet U.S. National Mapping Standards of the Office of Management and Budget. This data has no warranties in its content or accuracy when used for purposes other than those intended by the Humboldt-Toiyabe National Forest.

Figure 3-13

In Nevada, the State Environmental Commission and the Nevada Division of Environmental Protection regulate water quality. Under Section 305(b) of the CWA, the state prepares biennial reports of the status of water quality under its jurisdiction (NDEP 2011). The BLM regulates activities that could affect water resources on public lands under the authority of FLPMA. Nevada has compiled lists of designated uses for water bodies within their borders. In general, numeric standards are developed for the designated uses and for specific water bodies, and narrative standards are developed for all waters of the state. The state also has antidegradation policies that stipulate that water bodies having quality that is better than the standards must generally have the higher quality maintained.

State water management agencies monitor water quality to determine whether standards are being achieved. Section 303(d) of the CWA directs the states to compile a list of those waters that need additional measures beyond existing controls to achieve or maintain water quality to the standards (NDEP 2011). For each water body on the 303(d) list, a total maximum daily load must be developed. This is a calculation of the maximum quantity of a pollutant that can be added to a water body from all sources without exceeding the water quality standard for that pollutant. Total maximum daily loads help regulators devise measures to meet water quality standards by identifying and quantifying both point and nonpoint sources contributing to a pollution problem.

3.9.1 Bridgeport Geothermal Decision Area

The five hydrologic units occurring in the Bridgeport Geothermal Decision Area are discussed as follows (**Figure 3-14**, Bridgeport Geothermal Decision Area Hydrologic Units):

- East Walker Hydrologic Unit – The East Fork of the Walker River is the main perennial drainage in this area and is fed by intermittent streams in the area. The East Fork of the Walker River flows in a northerly direction and out of the decision area.
- Fish Lake-Soda Springs Valleys Hydrologic Unit – The fish lake-soda springs valleys includes a series of intermittent streams that terminate at a seasonal playa feature in a confined basin.
- Mono Lake Hydrologic Unit – The Mono Lake Hydrologic Unit includes a series of intermittent streams that drain to the southwest and out of the decision area.
- Walker Lake Valley Hydrologic Unit – The Walker Lake Hydrologic Unit includes a series of intermittent streams that drain to the north and east out of the decision area.
- West Walker Hydrologic Unit – The West Walker River, a perennial stream, drains in a northerly direction through the project area and continues out of the decision area to the north.

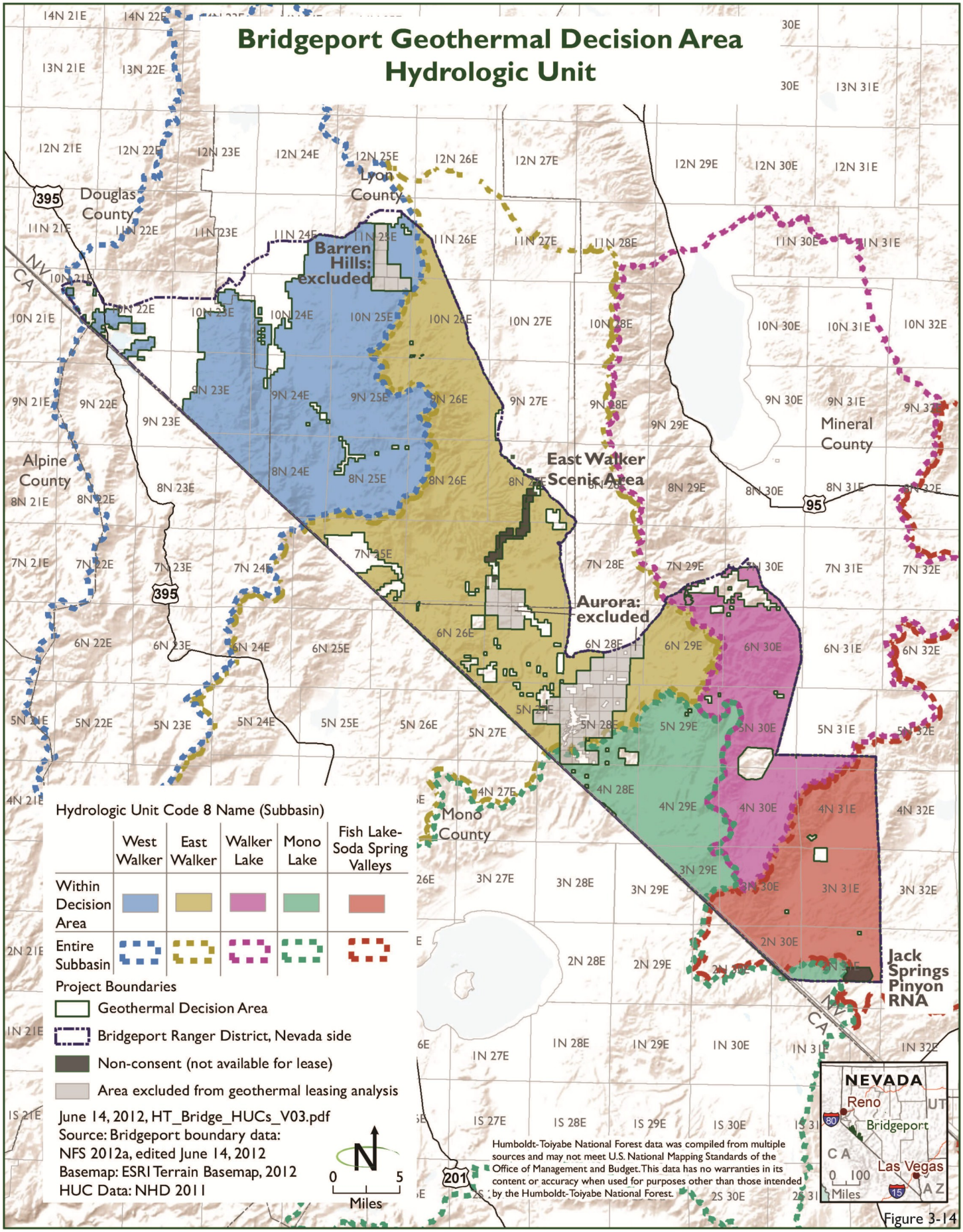

Bridgeport Geothermal Decision Area
Hydrologic Unit
Douglas County
Lyon County
Barren Hills: excluded
Alpine County
East Walker Scenic Area
Mineral County
Aurora: excluded
Mono County
Jack Springs Pinyon RNA
NV
CA
395
95
201
Hydrologic Unit Code 8 Name (Subbasin)
West Walker
East Walker
Walker Lake
Mono Lake
Fish Lake-Soda Spring Valleys
Within Decision Area
Entire Subbasin
Project Boundaries
Geothermal Decision Area
Bridgeport Ranger District, Nevada side
Non-consent (not available for lease)
Area excluded from geothermal leasing analysis
June 14, 2012, HT_Bridge_HUCs_V03.pdf
Source: Bridgeport boundary data: NFS 2012a, edited June 14, 2012
Basemap: ESRI Terrain Basemap, 2012
HUC Data: NHD 2011
N
0 5
Miles
Humboldt-Toiyabe National Forest data was compiled from multiple sources and may not meet U.S. National Mapping Standards of the Office of Management and Budget. This data has no warranties in its content or accuracy when used for purposes other than those intended by the Humboldt-Toiyabe National Forest.
NEVADA
Reno
Bridgeport
Las Vegas
UT
CA
AZ
0 100
Miles

Figure 3-14

Average rainfall Bridgeport Geothermal Decision Area averages 4.54 inches with an average annual snowfall of 2.8 inches (WRCC 2011a).

3.9.2 Austin Geothermal Decision Area

The Austin Geothermal Decision Area is located in the North Big Smokey Hydrologic Unit and has two un-named intermittent streams (Figure 3-8). Surface drainage is generally to the north and east. There are no perennial surface water bodies in the Austin Geothermal Decision Area. There is a seasonally saturated playa feature located in the northernmost part of the decision area. The annual average total precipitation is 12.37 inches with an average annual snowfall of 57.6 inches (WRCC 2011c).

3.9.3 Ely Geothermal Decision Area

The Ely Geothermal Decision Area is located in the White Hydrologic Unit in eastern Nevada and has many un-named intermittent streams. Surface drainage is generally to the east. There are no perennial surface water bodies in the Ely Geothermal Decision Area. However, the White River is a perennial stream bordering the southern portion of the decision area and it is one of the most significant water sources within the Ely Ranger District. The White River is mentioned in historic accounts and is frequented by anglers. Other nearby surface waters include Cottonwood Creek on the northern boundary of the Ely Geothermal Decision Area and Ellison Creek.

The climate is less arid than around the Bridgeport Ranger District, with an annual average total precipitation of 9.68 inches and an average annual snowfall of 53.5 inches (WRCC 2011b).

3.9.4 Tonopah Geothermal Decision Area

The Tonopah Geothermal Decision Area is located in the North Big Smoky Valley Hydrologic Unit in central Nevada and has three intermittent streams onsite. Surface drainage is generally to the east. There are no perennial surface water bodies in the decision area.

Similar to the Bridgeport Geothermal Decision Area, Tonopah has an annual average total precipitation of 5 inches. The average annual snowfall amount is 13 inches (WRCC 2011d).

3.10 AIR QUALITY AND AIR QUALITY RELATED VALUES

Ambient air quality is affected by the type and amount of air pollutants emitted into the atmosphere, the size and topography of the air basin, prevailing meteorological conditions, and the conversion of air pollutants and other species by a complex series of chemical and photochemical reactions in the atmosphere. The levels of air pollutants are generally expressed in terms of concentration, either in units of parts per million (ppm), parts per billion (ppb), or micrograms per cubic meter ($\mu g/m^3$).

3.10.1 Regulatory Framework

Clean Air Act

The Clean Air Act (CAA) (42 USC §§ 7401−7642) established the principal framework for national, state, and local efforts to protect air quality in the US. Under the CAA, the EPA has set time-averaged standards known as national ambient air quality standards (NAAQS) for six air pollutants considered to be key indicators of air quality: carbon monoxide, nitrogen dioxide, ozone, sulfur dioxide, lead, and two categories of particulate matter (particulate matter with an aerodynamic diameter of 10 microns or less [PM_{10}] and particulate matter with an aerodynamic diameter of 2.5 microns or less [$PM_{2.5}$]). **Table 3-3**, National Ambient Air Quality Standards, lists the NAAQS. States may set their own ambient air quality standards, but these standards must be at least as stringent as the national standards. The State of Nevada has adopted most of the national ambient air quality standards to regulate air pollution in the state. The state has adopted a more stringent carbon monoxide standard for areas higher than 5,000 feet above mean sea level, a more stringent sulfur dioxide standard, and a standard for hydrogen sulfide, for which there is no national standard (Nevada Administrative Code 445B.22097).

Table 3-3
National Ambient Air Quality Standards

Pollutant	Primary Standards		Secondary Standards
	Averaging Time	Level	Level
Carbon Monoxide	8-hour	9 ppm (10 mg/m³)	None
	1-hour	35 ppm (40 mg/m³)	None
Lead	Rolling 3-Mo. Average	0.15 µg/m³	Same as Primary
	Quarterly Average	1.5 µg/m³	Same as Primary
Nitrogen Dioxide	Annual (Arith. Ave.)	53 ppb	Same as Primary
	1-hour	100 ppb	None
Particulate Matter (PM_{10})	24-hour	150 µg/m³	Same as Primary
Particulate Matter ($PM_{2.5}$)	Annual (Arith. Ave.)	15.0 µg/m³	Same as Primary
	24-hour	35 µg/m³	Same as Primary
Ozone[1]	8-hour	0.075 ppm	Same as Primary
Sulfur Dioxide	3-hour	None	0.5 ppm
	1-hour	75 ppb	None

Source: EPA 2010
[1]On January 6, 2010, EPA proposed to revise the 8-hour ozone primary standard to between 60 and 70 ppb; final rule on this proposal is still pending.

A NAAQS is composed of two parts – an allowable concentration of a criteria pollutant and an averaging time over which the concentration is to be measured. Averaging times are based on whether the damage caused by the pollutant is

more likely to occur during exposure to a high concentration for a short time or to a lower average concentration over a longer period. For some pollutants, there is more than one air quality standard, reflecting both short-term and long-term effects. Primary standards set limits to protect public health, including the health of sensitive populations such as asthmatics, children, and the elderly. Secondary standards set limits to protect public welfare, including protection against decreased visibility and damage to animals, crops, vegetation, and buildings.

The CAA also regulates toxic air pollutants, or hazardous air pollutants, that are known or suspected to cause cancer or other serious health effects or adverse environmental impacts. EPA has issued rules covering 80 categories of major industrial sources as well as categories of smaller sources. Geothermal plants are not one of these sources.

Clean Air Act Conformity Requirements

Section 176(c) of the CAA requires that federal actions conform to the appropriate State Implementation Plan. A State Implementation Plan is a plan developed at the state level that provides for the implementation, maintenance, and enforcement of NAAQS and is enforceable by the EPA. The EPA has promulgated rules establishing conformity analysis procedures for transportation-related actions and for other general federal agency actions (40 CFR Parts 6, 51, and 93). The EPA general conformity rule requires preparation of a formal conformity determination document for federal agency actions that are undertaken, approved, or funded in federal nonattainment or maintenance areas when the total net change in direct and indirect emissions of nonattainment pollutants (or their precursors) exceed specified thresholds. Because the ranger districts are not located in a nonattainment area, the proposed action is exempt from the CAA general conformity rule.

Prevention of Significant Deterioration (PSD)

As an attainment area, counties in which the ranger districts are located (Douglas, Mineral, Lyon, Nye, Lander, and White Pine) are classified as Class II areas under CAA Prevention of Significant Deterioration (PSD) guidelines. Air quality control regions are classified either as Class I, II, or III to indicate the degree of air quality deterioration that the state or federal government will allow while not exceeding NAAQS (though no Class III areas have been identified). As a Class II area, a moderate change in air quality due to industrial growth while still maintaining air quality that meets the NAAQS would be allowed. Class I areas are special areas of natural wonder and scenic beauty, such as national parks, national monuments, and wilderness areas, where air quality should be given special protection. Class I areas are subject to maximum limits on air quality degradation. There are no Class I areas within 62 miles of the Austin, Tonopah, and Ely Ranger Districts. The Bridgeport Ranger District is within 62 miles of Yosemite and Kings Canyon National Parks, and the Desolation, Mokelumne, Hoover, Ansel Adams, and John Muir Wilderness Areas.

PSD requires major sources or major modification of sources to obtain permits for attainment pollutants. Geothermal plants are not a rule-listed emissions source; therefore, the PSD trigger levels are 250 tons per year for each criteria pollutant emitted during individual plant operations.

3.10.2 Regional Air Quality

Based on measured ambient criteria air pollutant concentrations, the EPA classifies areas of the US according to whether they meet the NAAQS. Areas that violate air quality standards are identified as nonattainment areas for the relevant criteria air pollutants. Areas that comply with air quality standards are identified as attainment areas for the relevant criteria air pollutants. Areas that have transitioned from nonattainment to attainment are considered maintenance areas. Areas of uncertain status are generally identified as unclassifiable but are treated as attainment areas for regulatory purposes. All of the Nevada counties in which the planning area is located are either unclassified or attainment for all of the NAAQS.

3.11 VEGETATION

Methods

Information regarding vegetation resources within the Humboldt-Toiyabe Geothermal Leasing Planning Area is based on the Southwest Regional Gap Analysis Project (SWReGAP) (USGS National Gap Analysis Project 2004). No vegetation surveys have been conducted for this project.

Table 3-4, Most Common Vegetation Communities within the Humboldt-Toiyabe Geothermal Leasing Planning Area, lists the most common vegetation communities within the planning area broken out by each decision area. Descriptions of the vegetation communities are provided below.

Table 3-4
Most Common Vegetation Communities within the Humboldt-Toiyabe Geothermal Leasing Planning Area

Vegetation Communities[1]	Acres[2]			
	Bridgeport	Ely	Austin	Tonopah
Cliff and Canyon	6,800	--	--	--
Conifer Forest	5,210	--	--	--
Greasewood Flat	450	--	--	--
Invasive	1,200	--	--	--
Montane Grassland	3,100	--	--	--
Pinyon Juniper	294,760	1,380	760	--
Playa	540	--	--	--
Riparian	360	--	--	--
Sagebrush	202,230	2,140	3,200	70
Salt Desert and Semi Desert	91,700	10	--	90

[1] Habitat types are based on SWReGAP landcover types (USGS National Gap Analysis Program 2005).
[2] Rounded to the nearest ten acres

Cliff and Canyon

Cliff and canyon communities are barren and sparsely vegetated landscapes of steep cliff faces, narrow canyons, and smaller rock outcrops. This cover type is found from foothill to subalpine elevations, and includes the vegetation on unstable scree and talus slopes that are typically found below cliff faces (USGS National Gap Analysis Program 2005).

Conifer Forest

Conifer forest communities are dominated by a single or a mix of conifer species, including spruce (*Picea* spp.), fir (*Abies* spp.), lodgepole pine (*Pinus contorta*), and bristlecone pine (*P. longaeva*). This vegetation type can be in dry or mesic areas and is generally found at higher elevations (over 8,000 feet) within the planning area. Shrub and understory species are varied depending on the location but may include huckleberry (*Vaccinium* spp.), rhododendron (*Rhododendron* spp.), manzanita (*Arcostaphylos* spp.), currant (*Ribes* spp.), or mountain mahogany (*Cercocarpus* spp.) (USGS National Gap Analysis Program 2005).

Greasewood Flat

Greasewood flat communities typically are present near drainages on stream terraces and flats or near playas where water is available. This vegetation type is usually a mosaic of multiple communities, with open to moderately dense shrublands dominated by greasewood (*Sarcobatus* spp.). Other common species include shadscale (*Atriplex confertifolia*), four-winged saltbush (*Atriplex canescens*), rubber rabbitbrush (*Chrysothamnus nauseosus*), and salt grass (*Distichlis spicata*). Soils within this community are generally quite alkaline (USGS National Gap Analysis Program 2005).

Invasive

Areas classified as invasive are dominated by introduced annual or perennial grasses or annual or biennial forbs. Characteristic invasive species include tamarisk (*Tamarix ramosissima*), cheatgrass (*Bromus tectorum*), halogeton (*Halogeton glomeratum*), and perennial pepperweed (*Lepidium latifolium*) (USGS National Gap Analysis Program 2005).

Montane Grassland

This vegetation community is composed of open dry meadows and grasslands up to 10,600 feet elevation. Soils tend to be deeper than surrounding forest soils, and these large-patch grasslands are intermixed with conifer stands. Dominant species include wildrye (*Elymus* spp.), Idaho fescue (*Festuca idahoensis*), and nodding needlegrass (*Nassella cernua*) (USGS National Gap Analysis Program 2005).

Pinyon Juniper

Pinyon-juniper vegetation communities are present on warm, dry sites on mountain slopes, mesas, plateaus, and ridges between 5,250 to 8,530 feet elevation. They are generally dominated by either pinyon pine (*Pinus monophylla*)

or Utah juniper (*Juniperus osteosperma*), or a combination of the two species (USGS National Gap Analysis Program 2005).

Playa

Playas are collection points of water which evaporate during the warmer months. They are usually barren or sparsely vegetated areas commonly covered with salt crusts (USGS National Gap Analysis Program 2005). Salt-tolerant plants may grow in playas, such as salt grass, alkali weed (*Cressa truxillensis*), and boraxweed (*Nitrophila occidentalis*).

Riparian

Riparian areas are found as narrow bands of shrubs or trees lining stream banks, seeps, and springs. Often, riparian areas are composed of a mosaic of multiple communities and are found between 4,000 and 7,000 feet elevation. Common species include alder (*Alnus* spp.), birch (*Betula* spp.), aspen (*Populus tremuloides*), willows (*Salix* spp.), and dogwood (*Cornus* spp.) (USGS National Gap Analysis Program 2005).

Sagebrush

Sagebrush habitats within the planning area are composed mainly of two SWReGAP habitat types: Big Sagebrush Shrubland, and Xeric Mixed Sagebrush Shrubland. Both habitat types are dominated by sagebrush species such as Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*), basin big sagebrush (*A. t.* ssp. *tridentata*), black sagebrush (*A. nova*), and low sagebrush (*A. arbuscula*). The composition of forbs and shrubs is diverse within this vegetation community and varies by slope, aspect, and elevation. Sagebrush habitats generally are found between 5,000 and 7,500 feet elevation (USGS National Gap Analysis Program 2005).

Salt Desert and Semi Desert

This vegetation community is a combination of salt desert scrub and semi desert shrub steppe SWReGAP communities which tend to intergrade. Generally, this community is found at lower elevations (less than 5,000 feet) and is composed of open-canopied shrublands typical of alluvial slopes and plains. Often there is a substantial grass component, particularly in the semi desert shrub steppe areas. Common species include greasewood, shadscale, budsage (*Artemisia spinescens*), winterfat (*Krascheninnikovia lanata*), indian ricegrass (*Achnatherum hymenoides*), Sandberg bluegrass (*Poa secunda*), and blue grama (*Bouteloua gracilis*) (USGS National Gap Analysis Program 2005).

3.11.1 Bridgeport Geothermal Decision Area

The Bridgeport Geothermal Decision Area includes diverse vegetation communities which are reflective of the elevation ranges within the decision area, from 4,950 feet to 9,540 feet. Vegetation communities range from low elevation salt desert scrub to high elevation coniferous forest. Table 3-4 lists the most common vegetation communities within the decision area. The major vegetation types in the decision area are Pinyon-juniper woodland and

sagebrush. The Pinyon-juniper woodland covers 294,760 acres (49 percent) of the decision area, and sagebrush communities cover 202,230 acres (33 percent) of the decision area. Salt desert scrub and semi desert shrub steppe are also common, covering 91,700 acres (15 percent) of the decision area. Other vegetation types in the decision area include the following; riparian areas cover 360 acres (0.06 percent); cliff and canyon covers 6,800 acres (1 percent); conifer forest covers 5,210 acres (0.9 percent); greasewood flat covers 450 acres (0.07 percent); invasive species cover 1,200 acres (0.2 percent); montane grassland covers 3,100 acres (0.5 percent); and playa covers 535 acres (less than 0.01 percent).

3.11.2 Austin Geothermal Decision Area

Vegetation within the Austin Geothermal Decision Area is composed mainly of big sagebrush shrubland (2,660 acres, 67 percent), with 760 acres of pinyon-juniper woodland (19 percent) and 530 acres of mixed sagebrush shrubland (14 percent). Elevations within the decision area range from 6,500 to 7,300 feet.

3.11.3 Ely Geothermal Decision Area

Vegetation within the Ely Geothermal Decision Area is composed mainly of mixed sagebrush shrubland (1,580 acres, 45 percent), with 1,380 acres of pinyon-juniper woodland (39 percent), 560 acres of big sagebrush shrubland (16 percent), and 10 acres of semi-desert and salt desert scrub (0.3 percent). Elevations within the decision area range from 6,000 to 6,800 feet.

3.11.4 Tonopah Geothermal Decision Area

Vegetation within the Tonopah Geothermal Decision Area is composed of mainly mixed salt desert scrub (80 acres, 46 percent), with 60 acres of big sagebrush shrubland (38 percent), 20 acres of semi-desert shrub-steppe (10 percent), and 10 acres of mixed sagebrush shrubland (6 percent). Elevations within the decision area range from 5,800 to 6,000 feet.

3.12 FISH AND WILDLIFE

This section discusses management indicator species (MIS) and species of interest for the Forest Service and NDOW. In this analysis, these species and groups of species are used as a proxy for all fish and wildlife within the planning area. MIS are identified in the Toiyabe National Forest LRMP as representing a group of species having similar habitat requirements. MIS are not federally listed as threatened, endangered, or Forest Sensitive, but have the potential to be affected by project activities. The Forest Service has also named species of interest that should be considered in NEPA analyses. In addition, NDOW listed wildlife resources to be considered in their scoping letter (NDOW 2011b). For the purposes of this NEPA analysis, these wildlife resources are referred to as NDOW species of interest.

A review was conducted to determine: 1) if the Humboldt-Toiyabe Geothermal Planning Area is within the range of any MIS or species of interest, 2) if habitat is present within the planning area, and 3) if there are potential direct, indirect, or

cumulative effects on habitat components. MIS and species of interest associated with habitats that may be affected by Forest Service consent to leasing the lands in the geothermal decision areas are presented in **Table 3-5**, List of MIS and Species of Interest on the Humboldt-Toiyabe National Forest, and are analyzed below.

Table 3-5
List of MIS and Species of Interest on the Humboldt-Toiyabe National Forest

Species	Status[1]	Bridgeport	Austin	Ely	Tonopah
Mammals					
Mule deer	MIS, NDOW	X	X	X	X
Pronghorn	NDOW	X	X	X	X
Elk	NDOW			X	
Desert bighorn sheep	NDOW	X		X	X
American marten	MIS	X			
Birds					
Yellow warbler	MIS	X	X		X
Yellow-rumped warbler	MIS	X			
Hairy woodpecker	MIS	X	X		X
Williamson's sapsucker	MIS	X	X		X
Willow flycatcher	FS	X			
Northern goshawk	MIS		X	X	X
Greater sage-grouse	MIS NDOW	X	X	X	X
Migratory birds	FS	X	X	X	X
Raptors	NDOW	X	X	X	X
Amphibians					
Mount Lyell salamander	FS	X			
Fish					
Lahontan cutthroat trout	MIS	X	X		X
Paiute cutthroat trout	MIS		X		X
Bonneville cutthroat trout	MIS			X	
Trout	MIS			X	
Invertebrates					
Macroinvertebrates	MIS	X			

[1] MIS = Management indicator species
NDOW = NDOW species of interest
FS = Forest Service species of interest

The SWReGAP was reviewed to determine the potential habitat types for animal species which may be affected by the proposed project (USGS National Gap Analysis Program 2004). The Nevada Natural Heritage Database and NatureServe Explorer were used to determine potential habitat requirements for all MIS and species of interest. NDOW provided species presence and range distribution information for NDOW species of interest within the decision areas and including a three-mile buffer around the decision areas (NDOW 2011b).

Mule Deer

Mule deer exist throughout the western US, from the Great Plains westward, and range throughout all of Nevada. The wide range of elevation areas and vegetation types found in the Humboldt-Toiyabe National Forest provides summer, transition, and critical winter habitat for mule deer. Summer habitat is found in the higher elevation sites that are characterized by montane forests, aspen, and mountain shrub plant communities. Fawning areas must be interspersed with forage, hiding cover, and thermal cover for the doe. Critical winter range is then concentrated at lower elevations on south and west facing slopes, primarily on the east side of the forest. These areas typically receive less snow and are dominated by dense sagebrush/bitterbrush and pinyon/juniper communities. Mule deer exhibit high fidelity to individual seasonal ranges. The species browses on a wide variety of woody plants and grazes on grasses and forbs. Throughout the year most activity occurs at dawn and dusk. Breeding peaks mainly late November to mid-December and young are born mostly in May through June (Wildlife Action Plan Team 2006).

Mule deer in Nevada have suffered a 50 percent population decline since the 1980s. This may be due to loss of wintering habitat from urbanization, as well as cattle grazing, which results in the loss of hiding cover for fawns and possibly increases the loss of fawns to predation (Wildlife Action Plan Team 2006).

Pronghorn Antelope

Pronghorn antelope (*Antilocapra americana*) range throughout the central and western US and are present year-round throughout northern and central Nevada. The species lives in grasslands, sagebrush plains, deserts, and foothills, usually in small bands (NatureServe 2011). During summer, pronghorn are widely distributed throughout valleys, mountain foothills, and mountaintops. The sagebrush community is used for both thermal cover and forage (BLM 2010). Its diet is composed of forbs and shrubs, and the amount of free water needed varies with the succulence of vegetation in the diet. Pronghorn breed from late summer to early fall and young are born in late spring (NatureServe 2011).

Elk

Elk exist throughout the western US and small populations can be found in Nevada. Elk are currently expanding their range across Nevada in response to improved range conditions with more significant grass components (Wildlife Action Plan Team 2006). The species uses a variety of habitats, including alpine pastures, marshy meadows, river flats, aspen parkland, coniferous forests, forest edges, and semi-desert areas. Elk do not require special calving grounds; calves are born in valleys or in areas as high as alpine tundra. Generally the species moves to higher elevations in summer and winters in valleys. Mature males defend the female herd during the rut in September and October, and calves are born in late spring. Elk are primarily grazers, but also consume forbs and may browse on shrubs and trees where grasses are unavailable. The species is most active at dawn and dusk (NatureServe 2011).

Desert Bighorn Sheep

Desert bighorn sheep is an NDOW species of interest and is also on the Forest Service R4 Sensitive Species list. It is described in detail in Section 3.13, Threatened, Endangered, and Special Status Species.

American Marten

The following account was excerpted from the draft Summary of Forest Planning Assessment for Wildlife Species Diversity Humboldt-Toiyabe National Forest 2005-2008 (Middlebrook 2009).

This species' core elevation range is from 5,500 to 10,000 feet, and they are often found in the Sierra Nevada above 7,200 feet. Although marten are wide-ranging carnivores and likely to be found in suitable habitats across the Sierra Nevada, martens are considered rare compared to many other species of mid-sized carnivores.

Martens prefer coniferous forest habitat with large diameter trees and snags, large down logs, moderate-to-high canopy closure, and an interspersion of riparian areas and meadows. Important habitat attributes are: vegetation diversity, with predominately mature forest; snags; dispersal cover; and large woody debris. Martens select stands with 40 to 60 percent canopy closure for resting and foraging and avoid stands with less than 30 percent canopy closure (USDA 2001). Martens generally avoid habitats that lack overhead cover, presumably because these areas do not provide protection from avian predators. Various studies in the Sierra indicate that martens have a strong preference for forest-meadow edges, and riparian forests appear to be important foraging habitats as well (USDA 2001). Complex physical structures (large snags, large down woody material, and debris piles), especially near the ground, appear to provide protection from predators, prey sources, access to subnivean spaces, and protective thermal microenvironments, especially in the winter (USDA 2001).

Yellow Warbler

The yellow warbler (*Dendroica petechia*) is found in montane chaparral, open ponderosa pine and mixed conifer as well as riparian woodlands from sea level to 8,000 feet (Zeiner et al. 1990). Yellow warblers are usually found in riparian deciduous habitats in summer including cottonwoods, willows, alders and other small trees and shrubs typical of low, open-canopy riparian woodland. They are an indicator species for healthy lowland riparian habitat (GBBO 2010). Suitable habitat includes open to medium-density woodlands and forests with a heavy brush understory. Breeding occurs from mid-April into early August with peak activity in June. Nests are open cups placed two to 16 feet above the ground in a deciduous sapling or shrub.

Yellow-rumped Warbler

The yellow-rumped warbler (*Dendroica coronata*) is found in ponderosa pine to subalpine conifer and pinyon-juniper habitats. It most commonly breeds in

Douglas-fir and lodgepole pine. During the breeding season, yellow-rumped warblers find cover in middle and high-elevation coniferous forests; they move to lower elevations in the winter. They are also found in transition areas between conifers and aspen or willow. Breeding occurs from mid-May through July. Nests are well-concealed and open-cupped placed three to 100 feet above the ground in a conifer or deciduous tree or shrub. Yellow-rumped warblers eat mostly insects and spiders.

Hairy Woodpecker

Hairy woodpeckers (*Picoides villosus*) live in mixed conifer and riparian deciduous habitats from sea level to 9,000 feet. Suitable habitat includes stands of large, mature trees and snags of sparse to intermediate density. Breeding occurs from mid-March to late August, with peak activity occurring in late May through June. Nests are found in cavities from three to 100 feet above the ground in snags or dead branches. Hairy woodpeckers feed on beetles, ants, caterpillars, spiders, acorns, dogwood, and pine nuts.

Williamson's Sapsucker

The Williamson's sapsucker (*Sphyrapicus thyroideus*) is found in coniferous forests ranging in elevation from approximately 5,500 to 9,500 feet. Preferred nesting habitat for this species is lodgepole pine, but the sapsucker also nests in aspens adjacent to stands of red fir, Jeffrey pine, and eastside pine habitats. Snags or live trees with rotted heartwood provide suitable nesting and roosting habitat. Nesting cavities are excavated at a height of five to sixty feet. The peak of egg laying occurs in late May to mid-July. Williamson's sapsuckers feed primarily on wood-boring insects, such as ants.

Willow Flycatcher

Willow flycatcher (*Empidonax traillii*) is a breeding resident across most of the US, including Nevada. The species requires extensive thickets of willow or other riparian shrubs with saturated soils and nearby surface water. Willow flycatcher builds its nest in a tall (greater than 13 feet), very dense riparian shrub and breeds from late May through August. The bird eats a variety of flying insects (GBBO 2010).

Two similar subspecies likely breed in the planning area: *Empidonax traillii adastus* in central, eastern, and northern Nevada, and *E. t. brewsteri* in western Nevada. The former subspecies uses both lowland and montane riparian habitats, and occasionally is found in other inundated areas such as aspen stands or wet meadows. In contrast, *E. t. brewsteri* is primarily found in montane riparian habitat, with some spillover into lowland riparian areas (GBBO 2010).

The population of willow flycatchers in Nevada is estimated at 1,500 and declining at 3 percent per year. Both subspecies are riparian-obligates and have undergone large historical declines because of the widespread loss of dense, shrubby riparian habitat with water-saturated soils. Remaining populations are small and fragmented. The main habitat threats include:

- Loss degradation and fragmentation of lowland riparian habitat due to:
  - Surface water diversions, impoundments, and flood control,
  - Heavy livestock grazing;
- Desiccation of montane riparian and wet meadow habitat from water diversion, drought, or gullying; and
- Increase in nest predator access due to meadow desiccation and conifer encroachment.

Northern Goshawk

Northern goshawk is an MIS species and is also on the Forest Service R4 Sensitive Species list. It is described in detail in Section 3.13, Threatened, Endangered, and Special Status Species.

Greater Sage-Grouse

Greater sage-grouse is an MIS species and is also on the Forest Service R4 Sensitive Species list. It is described in detail in Section 3.13, Threatened, Endangered, and Special Status Species.

Migratory Birds and Raptors

The Migratory Bird Treaty Act of 1918 (16 USC 703-731), as amended, manages and protects migratory bird species through consultation with state and local governments and protection of land and water resources necessary for the conservation of migratory birds. Under the act, taking, killing, or possessing migratory birds is unlawful.

Executive Order (EO) 13186, signed January 10, 2001, lists several responsibilities of federal agencies to protect migratory birds, among them: 1) support the conservation intent of the migratory bird conventions by integrating bird conservation principles, measures, and practices into agency activities and by avoiding or minimizing, to the extent practicable, adverse impacts on migratory bird resources when conducting agency actions. Additional direction comes from the Memorandum of Understanding (MOU) between Forest Service and US Fish and Wildlife Service, signed January 17, 2001. The purpose of this MOU is to strengthen migratory bird conservation through enhanced collaboration between the Forest Service and US Fish and Wildlife Service, in coordination with state, tribal, and local governments. The MOU identifies specific activities for bird conservation, pursuant to EO 13186 including: 2) Strive to protect, restore, enhance, and manage habitat of migratory birds, and prevent the further loss or degradation of remaining habitats on National Forest System lands. This includes identifying management practices that impact populations of high priority migratory bird species, including nesting, migration, or over-wintering habitats, on National Forest System lands, and developing guidance would help inform future specific protocols called for in an MOU implementing the EO.

Within the National Forest System lands, conservation of migratory birds focuses on providing a diversity of habitat conditions at multiple spatial scales and ensuring that bird conservation is addressed when planning for land management activities. There is nesting habitat for many migratory bird species in the planning area and some of these species begin initiating nesting as early as April or May.

Mount Lyell Salamander

The Mount Lyell salamander exists only within California on the Bridgeport Ranger District, mostly above 8,000 feet elevation. It is unlikely to be present in the decision area and will be given no further discussion in this document.

Lahontan Cutthroat Trout

Lahontan cutthroat trout (*Oncorhynchus clarki henshawi*) is an MIS species and is also on the Forest Service R4 Sensitive Species list. It is described in detail in Section 3.13, Threatened, Endangered, and Special Status Species.

Paiute Cutthroat Trout

Paiute cutthroat trout (*O. c. seleniris*) is an MIS species and is also on the Forest Service R4 Sensitive Species list. It is described in detail in Section 3.13, Threatened, Endangered, and Special Status Species.

Bonneville Cutthroat Trout

Bonneville cutthroat trout (*O. c. utah*) is an MIS species and is also on the Forest Service R4 Sensitive Species list. It is described in detail in Section 3.13, Threatened, Endangered, and Special Status Species.

Trout

Trout as a group consist of seven species of fish: Lahontan cutthroat trout, Bonneville cutthroat trout, bull trout, redband trout, rainbow trout, brown trout, and brook trout. They are economically and socially important and are a barometer of water quality and the condition and trend of riparian zones. Trout require cool water not exceeding 70°F in the summer; stable streambanks; low streambed sedimentation; aquatic and terrestrial insects for food; instream cover; and pools.

Macroinvertebrates

Macroinvertebrates are widespread throughout the planning area and can be found in all types of perennial and ephemeral aquatic habitats including lakes, streams, seeps, and springs. Aquatic macroinvertebrates are invertebrates that live in water and can be seen by the unaided human eye. They provide an important ecological link between microscopic food organisms and fish. Because of their strict habitat requirements they are useful indicators of aquatic habitat conditions and changes (Mangum 1986). Aquatic macroinvertebrates include insects, such as the commonly thought of mayflies, stoneflies, caddisflies, and diptera (two-winged flies); crustaceans; mollusks; and freshwater earthworms (Mangum 1986).

Hafele and Roederer (1987) provide a short summary of aquatic insect life cycles in a stream. Aquatic insects go through a series of life stages in a stream. Insects with incomplete metamorphosis go through three stages: egg, nymph, and adult. This group includes the mayflies and stoneflies. Insects with complete metamorphosis go through four stages: egg, larva, pupa, and adult. This group includes the caddisflies and dipteria. The eggs hatch into young nymphs and larva. The majority of their life is spent in the nymph or larva stages. While growing these go through a variety of stages called instars. It is these nymph and larval stages that are usually collected in aquatic macroinvertebrate samples. The nymphs and larva (which go through a pupal stage first) then leave the water through emergence to become winged adults. The adults reproduce and lay eggs, completing the cycle.

3.12.1 Bridgeport Geothermal Decision Area

The presence of wildlife species within the Bridgeport Ranger Geothermal Decision Area is characteristic for the habitat types provided by the vegetation communities present in the decision area (Section 3.11). The following describe the potential presence of MIS and species of interest within the decision area. As mentioned above, several MIS and species of interest are also federally listed or Forest Service sensitive species and are discussed in Section 3.13.

Mule Deer

Mule deer distribution exists throughout the majority of the decision area and three-mile buffer area (NDOW 2011b).

Pronghorn Antelope

Pronghorn antelope was mentioned by NDOW as a species that could be present within the decision area. Pronghorn distribution exists in the central and southeastern portions of the decision area and three-mile buffer area (NDOW 2011b).

American Marten

American marten could be present within mature coniferous forest habitat within the decision area. However, the species has not been recorded.

Yellow Warbler

Suitable habitat for yellow warbler can be found within conifer and riparian woodlands within the decision area. The species has not been documented within the decision area.

Yellow-rumped Warbler

Suitable habitat for yellow-rumped warbler can be found within conifer forests within the decision area. The species has not been documented within the decision area.

Hairy Woodpecker

Hairy woodpecker has been observed in the vicinity of the decision area (NDOW 2011b). Mixed conifer and riparian habitats are found within the decision area, so the species has the potential to be present.

Williamson's Sapsucker

Potential habitat for Williamson's sapsucker exists in coniferous forests within the decision area. The species has not been documented within the decision area.

Willow Flycatcher

Willow flycatcher could exist in riparian areas within the decision area. The species has not been documented within the decision area.

Migratory Birds and Raptors

Various species of raptors are known to reside in the vicinity of the decision area. American kestrel (*Falco sparverius*), barn owl (*Tyto alba*), burrowing owl (*Athene cunicularia*), Cooper's hawk (*Accipiter cooperii*), ferruginous hawk (*Buteo regalis*), golden eagle (*Aquila chrysaetos*), great horned owl (*Bubo virginianus*), long-eared owl (*Asio otus*), merlin (*Falco columbarius*), northern harrier (*Circus cyaneus*), northern saw-whet owl (*Aegolius acadicus*), osprey (*Pandio haliaetus*), prairie falcon (*Falco mexicanus*), red-tailed hawk (*Buteo jamaicensis*), rough-legged hawk (*Buteo lagopus*), sharp-shinned hawk (*Accipiter striatus*), short-eared owl (*Asi flammeus*), Swainson's hawk (*Buteo swainsoni*), turkey vulture (*Cathartes aura*), and western screech owl (*Megascops kennicottii*) have distribution ranges that include the decision area and vicinity. Barn owl, burrowing owl, California condor (Gymnogyps californianus), Cooper's hawk, golden eagle, great horned owl, long-eared owl, northern pygmy owl, northern saw-whet owl, osprey, prairie falcon, red-tailed hawk, rough-legged hawk, Swainson's hawk, and turkey vulture have been directly observed in the vicinity of the decision area. Further, a number of raptor nest sites have been identified in the vicinity of the decision area, including one Cooper's hawk nest, six golden eagle nests, three great horned owl nests, two long-eared owl nests, one prairie falcon nest, four red-tailed hawk nests, and one Swainson's hawk nest. Three additional golden eagle nests have been documented within ten miles of the decision area (NDOW 2011b).

Other migratory birds that have been observed in the vicinity of the decision area include common loon (*Gavia immer*), common raven (*Corvus corax*), downy woodpecker (*Picoides pubscens*), evening grosbeak (*Coccothraustes vespertinus*), green heron (*Butorides virescens*), Heermann's gull (*Larus heermanni*), juniper titmouse (*Baeolophus ridgwayi*), long-billed curlew (*Numenius americanus*), mountain bluebird (*Sialia currucoides*), mountain chickadee (*Poecile gambeli*), pygmy nuthatch (*Sitta pygmaea*), spotted towhee (*Pipilo maculatus*), Steller's jay (*Cyanocitta stelleri*), western scrub jay (*Aphelocoma californica*), western tanager

(*Piranga ludoviciana*), white-breasted nuthatch (*Sitta carolinensis*), and white-throated swift (*Aeronautes saxatalis*) (NDOW 2011b).

Macroinvertebrates

Surveys have not been conducted to characterize the macroinvertebrates in the decision area. However, suitable habitat exists in perennial and ephemeral waterbodies including the East Fork Walker River, Desert Creek, Rough Creek, and Alkali Lake. Macroinvertebrates are also likely to be present within other small habitats, such as isolated seeps and springs that may be found within the decision area.

3.12.2 Austin Geothermal Decision Area

The presence of wildlife species within the Austin Geothermal Decision Area is characteristic for the habitat types provided by the vegetation communities present in the decision area (Section 3.11). The following sections describe the potential for MIS and species of interest to be found within the decision area. As mentioned above, several MIS and species of interest are also federally listed or Forest Service sensitive species and are discussed in Section 3.13.

Mule Deer

Occupied mule deer distribution exists in the southern half of the decision area and the southwestern portion and northern, northeastern, and eastern edge of the three-mile buffer area around the decision area (NDOW 2011b).

Pronghorn Antelope

Pronghorn antelope was mentioned by NDOW as a species that could exist within the decision area. Pronghorn distribution exists in the northeastern corner of the three-mile buffer around the decision area (NDOW 2011b).

Yellow Warbler

Based on the SWReGAP landcover types, there is no potential habitat for yellow warbler within the decision area. As such, the species is not expected to be present.

Hairy Woodpecker

Based on the SWReGAP landcover types, there is no potential habitat for hairy woodpecker within the decision area. As such, the species is not expected to be present.

Williamson's Sapsucker

Based on the SWReGAP landcover types, there is no potential habitat for Williamson's sapsucker within the decision area. As such, the species is not expected to be present.

Migratory Birds and Raptors

Various species of raptors are known to reside in the vicinity of the Austin Ranger District decision area. American kestrel, barn owl, burrowing owl,

Cooper's hawk, ferruginous hawk, golden eagle, great horned owl, long-eared owl, merlin, northern harrier, northern saw-whet owl, osprey, prairie falcon, red-tailed hawk, rough-legged hawk, sharp-shinned hawk, short-eared owl, Swainson's hawk, turkey vulture, and western screech owl have distribution ranges that include the decision area and vicinity. Furthermore, golden eagle, ferruginous hawk, and rough-legged hawk have been directly observed in the vicinity of the decision area, and a ferruginous hawk nest is located in the vicinity. No known golden eagle nests exist within ten miles of the vicinity (NDOW 2011b).

Macroinvertebrates

Surveys have not been conducted to characterize the macroinvertebrates in the decision area. However, based on topographic maps, it appears that suitable habitat exists in several ephemeral streams that run through the decision area.

3.12.3 Ely Geothermal Decision Area

The presence of wildlife species within the Ely Geothermal Decision Area is characteristic for the habitat types provided by the vegetation communities present in the decision area (Section 3.11). The following describe the potential for MIS and species of interest to be found within the decision area. As mentioned above, several MIS and species of interest are also federally listed or Forest Service sensitive species and are discussed in Section 3.13.

Mule Deer

Occupied mule deer distribution exists throughout the entire decision area and three-mile buffer area (NDOW 2011b).

Pronghorn Antelope

Pronghorn antelope was mentioned by NDOW as a species which could be present within the decision area. Pronghorn distribution exists throughout the eastern half of the decision area and northeastern corner of the three-mile buffer area (NDOW 2011b).

Elk

Elk was mentioned by NDOW as a species which could be present within the decision area. Occupied elk distribution exists throughout the entire decision area and three-mile buffer area (NDOW 2011b).

Migratory Birds and Raptors

Various species of raptors are known to reside in the vicinity of the decision area. The decision area is within known distribution range for American kestrel, barn owl, burrowing owl, Cooper's hawk, ferruginous hawk, golden eagle, great horned owl, long-eared owl, merlin, northern harrier, northern saw-whet owl, osprey, prairie falcon, red-tailed hawk, rough-legged hawk, sharp-shinned hawk, short-eared owl, Swainson's hawk, and turkey vulture. Furthermore, Cooper's hawk, golden eagle, great horned owl, and red-tailed hawk have been directly observed in the vicinity of the decision area. Four Cooper's hawk nests, one

great horned owl nest, and two red-tailed hawk nests have been identified in the vicinity of the decision area. In addition, three golden eagle nests are located within ten miles of the decision area (NDOW 2011b).

Trout

Suitable habitat does not exist for trout within the decision area. However, trout are present immediately adjacent to the decision area in the White River, as well as nearby in Ellison Creek.

3.12.4 Tonopah Geothermal Decision Area

The presence of wildlife species within the Tonopah Geothermal Decision Area is characteristic for the habitat types provided by the vegetation communities present in the decision area (Section 3.11). The following describe the potential for MIS and species of interest to be present within the decision area. As mentioned above, several MIS and species of interest are also federally listed or Forest Service sensitive species and are discussed in Section 3.13.

Mule Deer

Mule deer distribution exists throughout the entire decision area and western half of the three-mile buffer area (NDOW 2011b).

Pronghorn Antelope

Pronghorn antelope were mentioned by NDOW as a species which could be present within the decision area. Pronghorn antelope distribution exists throughout the entire decision area and the eastern half of the three-mile buffer area (NDOW 2011b).

Yellow Warbler

Based on the SWReGAP landcover types, there is no potential habitat for yellow warbler within the decision area. As such, the species is not expected to be present.

Hairy Woodpecker

Based on the SWReGAP landcover types, there is no potential habitat for hairy woodpecker within the decision area. As such, the species is not expected to be present.

Williamson's Sapsucker

Based on the SWReGAP landcover types, there is no potential habitat for Williamson's sapsucker within the decision area. As such, the species is not expected to be present.

Migratory Birds and Raptors

Raptors that are known to reside in the vicinity of the decision area include American kestrel, barn owl, burrowing owl, Cooper's hawk, ferruginous hawk, golden eagle, great horned owl, long-eared owl, merlin, northern harrier, northern saw-whet owl, osprey, prairie falcon, red-tailed hawk, rough-legged

hawk, sharp-shinned hawk, short-eared owl, Swainson's hawk, turkey vulture, and western screech owl. American kestrel, golden eagle, long-eared owl, prairie falcon, and turkey vulture have been directly observed in the vicinity of the decision area. Furthermore, one prairie falcon nest and two golden eagle nests are located in the vicinity of the decision area (NDOW 2011b).

Macroinvertebrates

Surveys have not been conducted to characterize the macroinvertebrates in the decision area. However, based on topographic maps, it appears that suitable habitat exists in several ephemeral streams that run through the decision area.

3.13 THREATENED, ENDANGERED, AND SPECIAL STATUS SPECIES

This section addresses only federally listed or proposed species as well as Forest Service sensitive species. No special status species surveys were conducted for this project.

Species listed as endangered under the Endangered Species Act of 1973 are those species that are "in danger of extinction throughout all or a significant portion of its range" (16 USC §§1532(6)). A species listed as threatened under the ESA is considered "likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range" (16 USC §§1532(20)). Proposed species for ESA listing are those species that were found to warrant listing as either threatened or endangered and were officially proposed as such in a Federal Register notice after the completion of a status review and consideration of other protective conservation measures.

Forest Service sensitive species are defined as "those plant and animal species identified by a Regional Forester for which population viability is a concern, as evidenced by a. significant current or predicted downward trends in population numbers or density, or b. significant current or predicted downward trends in habitat capability that would reduce a species' existing distribution" (Forest Service Manual 2670.5).

The SWReGAP was reviewed to determine the potential habitat types for animal species which may be affected by the proposed project (USGS National Gap Analysis Program 2004). The R4 Threatened, Endangered, and Sensitive Species List (1995), Nevada Natural Heritage Database, and NatureServe Explorer were used to determine potential habitat requirements for all R4 sensitive species. NDOW provided species presence and range distribution information for some species within the decision areas and including a three-mile buffer around the decision areas (NDOW 2011b).

Several federally listed and R4 sensitive species are unlikely to be present in the decision area due to lack of potential habitat and/or restricted range. These are listed in **Table 3-6**, Federally Listed and R4 Sensitive Species in the Humboldt-Toiyabe National Forest Without Potential Habitat in the Planning Area.

Table 3-6
Federally Listed and R4 Sensitive Species in the Humboldt-Toiyabe National Forest Without Potential Habitat in the Planning Area

Species	Status[1]	Decision Area[2]	Habitat	Rationale
Mammals				
Sierra Nevada bighorn sheep (*Ovis canadensis californiana*)	FE	Bridgeport	Open, rocky, sparsely vegetated areas, characterized by steep slopes and canyons. Most found above 10,000 feet. elevation	Species is found in California and is thus outside the planning area.
Sierra Nevada red fox (*Vulpes vulpes necator*)	R4 S	Bridgeport	Live above tree line or in subalpine woodlands in the summer and move to lower elevations in the winter.	Subspecies recently found in California, but is not expected to be present in Nevada as noted in the Nevada Wildlife Action Plan.
Birds				
Southwestern willow flycatcher (*Empidonax traillii extimus*)	FE	Bridgeport Austin Tonopah	Thickets, scrubby and brushy areas, open second growth, swamps, and open woodland	No potential habitat within the planning area.
White-headed woodpecker (*Picoides albolarvatus*)	R4 S	Bridgeport	Montane coniferous forests up to lodgepole pine and red fir habitats.	Restricted to the Carson Range in Nevada.
Three-toed woodpecker (*Picoides tridactylus*)	R4 S	Bridgeport Austin Tonopah Ely	Coniferous forest (primarily spruce or fir), less frequently found in mixed forests.	Species is found in northeastern Nevada, which is outside of the planning area.
Great gray owl (*Strix nebulosa*)	R4 S	Bridgeport Austin Tonopah	Dense coniferous and hardwood forest, especially pine, spruce, paper birch, poplar; also second growth, usually found near water,	Species is found in the California portion of the Bridgeport Ranger District, outside of the planning area.
Yellow-billed cuckoo (*Coccyzus americanus*)	R4 S	Bridgeport Austin Tonopah Ely	Nests in tall cottonwood and willow riparian woodland.	No potential habitat within the planning area.

Table 3-6
Federally Listed and R4 Sensitive Species in the Humboldt-Toiyabe National Forest Without Potential Habitat in the Planning Area

Species	Status[1]	Decision Area[2]	Habitat	Rationale
Amphibians and Reptiles				
Desert tortoise (*Gopherus agassizii*)	FT	Bridgeport Austin Tonopah	Is found in deserts and scrubland typically near chaparral creosote scrub, creosote bursage, and shadscale scrub.	Species is found in southern Nevada, which is outside of the planning area.
Columbia spotted frog (*Rana luteiuentris*)	R4 S	Bridgeport Austin Tonopah Ely	Highly aquatic; requires permanent quiet water; usually is found at the grassy/sedgy margins of streams, lakes, ponds, springs, and marshes	Planning area is outside the species range in Nevada.
Sierra Nevada yellow-legged frog (*Rana muscosa*)	R4 S	Bridgeport Austin Tonopah	Sunny river margins, meadow streams, isolated pools, and lake borders in the Sierra Nevada.	Species is found in the Sierra Nevada, outside of the planning area.
Yosemite toad (*Bufo canorus*)	R4 S	Bridgeport Austin Tonopah	Wet mountain meadows and borders of forests.	Species is found only in California, which is outside the planning area.
Fish				
Railroad Valley springfish (*Crenichthys nevadae*)	FT	Bridgeport Austin Tonopah	Habitat includes warm spring pools, outflow streams, and adjacent marshes. This fish is able to tolerate high temperatures and low dissolved oxygen.	Species is endemic to Railroad Valley in Nye County, outside of the planning area.
Bonneville cutthroat trout (*Oncorhynchus clarki utah*)	R4 S	Ely	Cool, well-oxygenated water and the presence of clean, well-sorted gravels with minimal fine sediments for successful spawning.	No historical habitat in planning area; Species is native to the Bonneville Basin in Utah and eastern Nevada.
Paiute cutthroat trout (*Oncorhynchus clarki seleniris*)	FT	Bridgeport Austin Tonopah	Cool, well-oxygenated water; prefers streams with moderate current in meadow areas; also occupies lakes if suitable spawning habitat is available.	No historical habitat for this species in the planning area. Species is native to the East Fork-Carson River Drainage.

Table 3-6
Federally Listed and R4 Sensitive Species in the Humboldt-Toiyabe National Forest Without Potential Habitat in the Planning Area

Species	Status[1]	Decision Area[2]	Habitat	Rationale
Columbia River bull trout (*Salvelinus confluentus*)	FT	Ely	Bottom of deep pools in cold rivers and large tributary streams, often in moderate to fast currents with temperatures of 45-50 F; also large coldwater lakes and reservoirs.	Found in the Columbia River and its tributaries, which are outside of the planning area.
Bull trout (*Salvelinus confluentus*)	FT	Ely	Same as for Columbia River bull trout. In Nevada, believed to consist of a single population in the Jarbidge River and headwater tributaries.	Species in unlikely to occur based on range.
Invertebrates				
Mount Charleston blue butterfly (*Icarcia shasta charlestonensis*)	R4 S	Bridgeport Austin Tonopah	Relatively flat ridgelines above 8,202 feet, but isolated individuals have been observed as low as 6,562 feet. Endemic to the Spring Mountains.	Unlikely to occur based on range.
Spring Mountain checkerspot (*Chlosyne acastus robusta*)	R4 S	Bridgeport Austin Tonopah	Only known to occur in the Spring Mountains from 5,900 to 8,900 feet elevation.	Unlikely to occur based on range.
Dark blue (*Euphilotes ancilla purpura*)	R4 S	Bridgeport Austin Tonopah	Only known to occur in the Spring Mountains above 5,500 feet.	Unlikely to occur based on range.
Morand's checkerspot (*Euphydryas anicia morandi*)	R4 S	Bridgeport Austin Tonopah	Endemic to the Spring Mountains. Found within the alpine zone, bristlecone pine, mixed conifer forest, and pinyon-juniper communities.	Unlikely to occur based on range.
Plants				
Charleston angelica (*Angelica scabrida*)	R4 S	Bridgeport Austin Tonopah	Endemic to the Spring Mountains and found in interior chaparral, mountain brush, and montane coniferous zones.	Unlikely to occur based on range.

Table 3-6
Federally Listed and R4 Sensitive Species in the Humboldt-Toiyabe National Forest Without Potential Habitat in the Planning Area

Species	Status[1]	Decision Area[2]	Habitat	Rationale
Meadow pussytoes (*Antennaria arcuata*)	R4 S	Ely	Found in alkaline meadows, seeps, and springs.	Unlikely to occur based on habitat and range.
Charleston pussytoes (*Antennaria soliceps*)	R4 S	Bridgeport Austin Tonopah	Endemic to the Spring Mountains and found in the subalpine conifer, lower alpine, and upper montane conifer zones.	Unlikely to occur based on range.
Rosy King's sandwort (*Arenaria kingii ssp. rosea*)	R4 S	Bridgeport Austin Tonopah	Endemic to the Spring Mountains and found in the pinyon-juniper, montane coniferous forest, and lower alpine coniferous zones.	Unlikely to occur based on range.
Grouse Creek rockcress (*Arabis falcatoria*)	R4 S	Ely	Known only from the southern Ruby Mountains in the mountain mahogany zone.	Unlikely to occur based on habitat and range.
Spring Mountains rockcress (*Arabis nevadensis*)	R4 S	Bridgeport Austin Tonopah	Endemic to the Spring Mountains.	Unlikely to occur based on range.
Ophir rockcress (*Arabis ophira*)	R4 S	Bridgeport Austin Tonopah	Widely scattered in the mountain sagebrush and subalpine conifer zones (9,960 to 10,520 feet). Endemic to the Toiyabe Range in Lander and Nye Counties, Nevada.	Unlikely to occur based on habitat and elevation range.
Washoe tall rockcress (*Arabis rectissima var. simulans*)	R4 S	Bridgeport Austin Tonopah	Endemic to the northern Carson Range in Jeffrey pine-white fir forest.	Unlikely to occur based on range.
Galena Creek rockcress (*Arabis rigidissima var. demota*)	R4 S	Bridgeport Austin Tonopah	Endemic to the northern Carson Range in pine-fir-aspen associations.	Unlikely to occur based on range.

Table 3-6
Federally Listed and R4 Sensitive Species in the Humboldt-Toiyabe National Forest Without Potential Habitat in the Planning Area

Species	Status[1]	Decision Area[2]	Habitat	Rationale
Tiehm rockcress (*Arabis tiehmii*)	R4 S	Bridgeport Austin Tonopah	Alpine boulder and rock field. Found over 9,000 feet in elevation in Washoe County. In Nevada, known only from the Mount Rose area in the northern Carson Range.	Decision area is out of the range of the species.
Clokey milkvetch (*Astragalus aequalis*)	R4 S	Bridgeport Austin Tonopah	Endemic to the Spring Mountains and often found in sagebrush, pine, and gambel oak.	Unlikely to occur based on range.
Lee Canyon milkvetch (*Astragalus oophorus var. clokeyanus*)	R4 S	Bridgeport Austin Tonopah	Considered endemic to the Spring Mountains until recently discovered farther north. Found in ponderosa pine forest, old burns with gambel oak, and in pinyon-juniper woodland.	Unlikely to occur based on range.
Spring Mountain milkvetch (*Astragalus remotus*)	R4 S	Bridgeport Austin Tonopah	Endemic to the southeastern slopes of the Spring Mountains in desert shrub or desert wash communities.	Unlikely to occur based on range.
Lamoille Canyon milkvetch (*Astragalus robbinsii* var. *occidentalis*)	R4 S	Ely	Endemic to the Ruby Mountains in riparian areas, near stream banks, or in higher elevation meadow margins.	Unlikely to occur based on habitat and range.
Goodrich biscuitroot (*Cymopterus goodrichii*)	R4 S	Bridgeport Austin Tonopah	Scree and talus slopes in the upper subalpine and lower alpine zones (7,300 to 11,100 feet). Known only from the Toiyabe and Humboldt Ranges in Lander, Nye, and Pershing Counties.	Unlikely to occur based on habitat.
Arid draba (*Draba arida*)	R4 S	Bridgeport Austin Tonopah	Subalpine conifer and lower alpine zones (7,600 to 11,100 feet). Lander and Nye Counties, Nevada endemic.	Unlikely to occur based on habitat.

Table 3-6
Federally Listed and R4 Sensitive Species in the Humboldt-Toiyabe National Forest Without Potential Habitat in the Planning Area

Species	Status[1]	Decision Area[2]	Habitat	Rationale
Wasatch draba (*Draba brachystylis*)	R4 S	Bridgeport Austin Tonopah	Endemic to the Spring Mountains and dependent on wetland margin areas in Nevada	Unlikely to occur based on range.
Jaeger draba (*Draba jaegeri*)	R4 S	Bridgeport Austin Tonopah	Endemic to the Spring Mountains and found in the subalpine conifer, lower alpine, and upper montane conifer zones.	Unlikely to occur based on range.
Serpentine draba (*Draba oreibata* var. *serpentina*)	R4 S	Bridgeport Austin Tonopah Ely	Lower alpine and upper subalpine conifer zones (10,000 to 11,926 feet). Known only from the Snake and Toiyabe Ranges in Lander and White Pine Counties.	Unlikely to occur based on habitat and elevation range.
Charleston draba (*Draba paucifructa*)	R4 S	Bridgeport Austin Tonopah	Endemic to the Spring Mountains and dependent on wetland margin areas.	Unlikely to occur based on range.
Nevada willowherb (*Epilobium nevadense*)	R4 S	Bridgeport	Associated with singleleaf pinyon and ponderosa pine; restricted largely to the Spring Mountains.	Unlikely to occur based on range.
Spring Mountain goldenweed (*Ericameria compacta*)	R4 S	Bridgeport Austin Tonopah	Endemic to the Spring and Sheep ranges in the subalpine and montane conifer zones.	Unlikely to occur based on range.
Snake Mountain erigeron (*Erigeron cavernensis*)	R4 S	Ely	Limestone ridges, outcrops, and cliffs, often with bristlecone pine, limber pine, and spruce.	Unlikely to occur based on habitat.
Sunflower flat buckwheat (*Eriogonum douglasii* var. *elkoense*)	R4 S	Ely	Known only from the Sunflower Flat area in Elko County.	Unlikely to occur based on range.

Table 3-6
Federally Listed and R4 Sensitive Species in the Humboldt-Toiyabe National Forest Without Potential Habitat in the Planning Area

Species	Status[1]	Decision Area[2]	Habitat	Rationale
Clokey buckwheat (*Eriogonum hermannii var. clokeyi*)	R4 S	Bridgeport Austin Tonopah	Found in the creosote-bursage, shadscale, and blackbrush zones between 4,000 and 6,000 feet elevation. Is found in Clark County and southeastern Nye County.	Unlikely to occur based on range.
Altered andesite buckwheat (*Eriogonum robustum*)	R4 S	Bridgeport Austin Tonopah	Mostly barren areas on ridges, knolls, and steep slopes of all aspects between 4,410 and 7,325 feet elevation.	Unlikely to occur based on range.
Clokey greasebrush (*Glossopetalon clokeyi*)	R4 S	Bridgeport Austin Tonopah	Endemic to the Spring Mountains and found in the mountain brush, montane conifer, and subalpine conifer zones.	Unlikely to occur based on range.
Smooth dwarf greasebrush (*Glossopetalon pungens var. glabra*)	R4 S	Bridgeport Austin Tonopah	Restricted to the Spring and Sheep ranges. Found in the pinyon-juniper, mountain mahogany, and montane conifer zones.	Unlikely to occur based on range.
Sierra Valley ivesia (*Ivesia aperta var. aperta*)	R4 S	Bridgeport Austin Tonopah	Found in the Carson and Virginia Ranges and Peavine Mountain. Dependent on wetland margin areas.	Unlikely to occur based on range.
Dog Valley ivesia (*Ivesia aperta var. canina*)	R4 S	Bridgeport Austin Tonopah	Endemic to Dog Valley, California. Found in yellow pine forest.	Unlikely to occur based on range.
Charleston ivesia (*Ivesia cryptocaulis*)	R4 S	Bridgeport Austin Tonopah	Endemic to the Spring Mountains and found in the alpine and upper subalpine conifer zones.	Unlikely to occur based on range.
Jaeger ivesia (*Ivesia jaegeri*)	R4 S	Bridgeport Austin Tonopah	Endemic to the Spring Mountains.	Unlikely to occur based on range.

Table 3-6
Federally Listed and R4 Sensitive Species in the Humboldt-Toiyabe National Forest Without Potential Habitat in the Planning Area

Species	Status[1]	Decision Area[2]	Habitat	Rationale
Plumas ivesia (*Ivesia sericoleuca*)	R4 S	Bridgeport Austin Tonopah	Known only from northeastern California in the northern High Sierra Nevada and southern Modoc Plateau.	Unlikely to occur based on range.
Basin jamesia (*Jamesia tetrapetala*)	R4 S	Ely	Crevices in limestone cliffs (7,000 and 10,720 feet). Found in Lincoln, Nye, and White Pine Counties.	Unlikely to occur based on habitat and elevation range.
Grimes vetchling (*Lathyrus grimesii*)	R4 S	Ely	Endemic to the northern Independence Range.	Unlikely to occur based on range.
Hitchcock bladderpod (*Lesquerella hitchcockii var. hitchcockii*)	R4 S	Bridgeport Austin Tonopah		
Maguire lewisia (*Lewisia maquirei*)	R4 S	Ely	Pinyon-juniper (7,360 to 8,280 feet). Endemic to the Quinn Canyon and Grant ranges in Nye County.	Unlikely to occur based on species distribution and elevation range.
Spjut's brittle-moss (*Orthotrichum spjutii*)	R4 S	Bridgeport Austin Tonopah	Shaded granitic rock outcrops in spray of waterfalls near 8,500 feet elevation. Is found only in California.	Unlikely to occur based on species distribution
Dune penstemon (*Penstemon arenarius*)	R4 S	Bridgeport Austin Tonopah	Dependent on sand dunes or deep sand (3,920 and 5,960 feet). Endemic to Nevada and found in Churchill, Mineral, and Nye Counties.	Unlikely to occur based on habitat.
Charleston beardtongue (*Penstemon leiophyllus var. keckii*)	R4 S	Bridgeport Austin Tonopah	Endemic to the Spring Mountains between 2,980 and 11,480 feet elevation.	Unlikely to occur based on range.
Mt. Moriah penstemon (*Penstemon moriahensis*)	R4 S	Ely	Subalpine conifer, subalpine sagebrush, mountain mahogany, and upper pinyon-juniper zones (7,100 to 10,800 feet). Endemic to White Pine County.	Unlikely to occur based on elevation range.

Table 3-6
Federally Listed and R4 Sensitive Species in the Humboldt-Toiyabe National Forest Without Potential Habitat in the Planning Area

Species	Status[1]	Decision Area[2]	Habitat	Rationale
Bashful beardtongue (*Penstemon pudicus*)	R4 S	Ely	Crevices, soil pockets, and coarse rocky soils in the subalpine sagebrush, mountain mahogany, and upper pinyon-juniper zones between 7,500 and 9,000 feet elevation.	Unlikely to occur based on elevation range.
Rhizome beardtongue (*Penstemon rhizomatosus*)	R4 S	Ely	Subalpine conifer zone (10,000 to 11,250 feet). Found on one mountain range in White Pine County.	Unlikely to occur based on habitat and elevation range.
Jaeger beardtongue (*Penstemon thompsoniae ssp. jaegeri*)	R4 S	Bridgeport Austin Tonopah	Spring Mountains, east to the Sheep Range, in southern Nevada. Is found in the pinyon-juniper to the subalpine conifer zones.	Unlikely to occur based on range.
Inconspicuous phacelia (*Phacelia inconspicua*)	R4 S	Ely	In Nevada known only from the northern Humboldt Range. Is found in sagebrush shrub fields.	Unlikely to occur based on range.
Small flower phacelia (*Phacelia minutissima*)	R4 S	Ely	Found in Elko and Eureka Counties in wet meadows or near springs.	Unlikely to occur based on habitat and range.
Whitebark pine (*Pinus albicaulis*)	R4 S	Bridgeport Austin Tonopah Ely	Alpine and subalpine plant communities, at or near timberline	Unlikely to occur based on habitat.
Marsh's bluegrass (*Poa abbreviata* ssp. *marshii*)	R4 S	Bridgeport Austin Tonopah Ely	Alpine scree, talus, and boulder fields above 11,600 feet. Recorded in White Pine County.	Unlikely to occur based on habitat and elevation range.
Ruby Mountain primrose (*Primula capillaris*)	R4 S	Ely	Endemic to the Ruby Mountains. Found in the subalpine conifer zone.	Unlikely to occur based on range.
Nevada primrose (*Primula cusickiana* var. *nevadensis*)	R4 S	Ely	Subalpine conifer and lower alpine zones (10,200 to 11,590 feet). Endemic to Nye and White Pine Counties.	Unlikely to occur based on habitat and elevation range.

Table 3-6
Federally Listed and R4 Sensitive Species in the Humboldt-Toiyabe National Forest Without Potential Habitat in the Planning Area

Species	Status[1]	Decision Area[2]	Habitat	Rationale
Clokey silene (*Silene clokeyi*)	R4 S	Bridgeport Austin Tonopah	Endemic to the Spring Mountains in the lower alpine and upper subalpine conifer zones.	Unlikely to occur based on range.
Nachlinger silene (*Silene nachlingerae*)	R4 S	Bridgeport Austin Tonopah Ely	Found mainly in the subalpine conifer zone between 7,160 to 11,250 feet. Endemic to Elko, Nye, and White Pine Counties.	Unlikely to occur based on habitat.
Railroad Valley globemallow (*Sphaeralcea caespitosa* var. *williamsii*)	R4 S	Ely	Found in mixed shrub, pinyon-juniper, and grass communities at elevations between 4,700 and 5,310 feet.	Unlikely to occur based on elevation range.
Low sphaeromeria (*Sphaeromeria compacta*)	R4 S	Bridgeport Austin Tonopah	Endemic to the Spring Mountains in the lower alpine and upper subalpine conifer zones.	Unlikely to occur based on range.
Charleston kittentails (*Synthyris ranunculina*)	R4 S	Bridgeport Austin Tonopah	Endemic to the Spring Mountains in the subalpine conifer to lower alpine zones.	Unlikely to occur based on range.
Alpine goldenweed (*Tonestus alpinus*)	R4 S	Bridgeport Austin Tonopah	Mountain mahogany, subalpine conifer, and lower alpine zones (8,900 to 11,000 feet). Endemic to Lander and Nye Counties.	Unlikely to occur based on habitat.
Charleston ground daisy (*Towsendia jonesii var. tumulosa*)	R4 S	Bridgeport Austin Tonopah	Found mainly in the Spring Mountains, with one population in eastern Nye County. Is found in the montane conifer zone.	Unlikely to occur based on habitat and range.
Leiberg clover (*Trifolium leibergii*)	R4 S	Ely	Known from the Independence and Jarbidge Mountains in Nevada. Volcanic outcrops on steep slopes	Unlikely to occur based on habitat and range.
Rollins clover (*Trifolium macilentum* var. *rollinsi*)	R4 S	Bridgeport Austin Tonopah	Steep slopes on talus, gravels, and in snow depressions near and above timberline (8,800 to 9,800 feet).	Unlikely to occur based on habitat.

Table 3-6
Federally Listed and R4 Sensitive Species in the Humboldt-Toiyabe National Forest Without Potential Habitat in the Planning Area

Species	Status[1]	Decision Area[2]	Habitat	Rationale
Charleston violet (*Viola charlestonensis*)	R4 S	Bridgeport Austin Tonopah	Found on gravelly slopes and dry washes in the Spring Mountains.	Unlikely to occur based on range.
Lithion violet (*Viola lithion*)	R4 S	Ely	Seasonally wet crevices in steep outcrops in the subalpine conifer zone (7,840 to 10,480 feet). In Nevada, known only from the White Pine and Pilot ranges.	Unlikely to occur based on habitat and elevation range.

Sources: NatureServe 2011; Wildlife Action Plan Team 2006; GBBO 2010; Morefield 2001
[1] R4 S = Region 4 sensitive species
[2] Indicates which Decision Area the species could occur in, based on habitat and range for the applicable Ranger District

Lahontan Cutthroat Trout

Lahontan cutthroat trout (LCT) (Oncorhynchus clarki henshawi) is the only federally listed species with the potential to occur within the planning area. Lahontan cutthroat trout historically occupied the East Fork Walker River, Desert Creek, Rough Creek, and Bodie Creek within the planning area. Lahontan cutthroat trout are obligatory stream spawners and spawn from April to July, with eggs being deposited in one-fourth to one-half inch gravels within riffles, pocket water, or pool crests. Good egg survival requires that spawning beds be relatively silt-free and well oxygenated. Water temperatures of less than 57°F are required from April through July for successful reproduction. Optimum temperatures include averages of 55°F with maximums less than 72 degrees. Lahontan cutthroat trout are opportunistic feeders, preying on aquatic and terrestrial invertebrates that occur in the drift. Terrestrial prey items may make up a significant portion of the diet of trout in small headwater streams and meadows during the summer months. In lakes, smaller trout feed primarily on surface insects and zooplankton and larger trout feed on other fish. Other prey items include bottom-dwelling insect larvae, crustaceans and snails.

The Lahontan cutthroat trout was listed as endangered in 1970 and reclassified in 1975 as threatened. Reasons for the decline in numbers include: 1) competition and hybridization with introduced exotic fish species, 2) habitat changes associated with grazing, logging, stream channelization, and water diversions and 3) commercial and sport over fishing. The range-wide trend for this species is unknown. A 5-year status review by the US Fish and Wildlife Service was completed in 2009 with no proposed change in listing status.

The following are Forest Service Sensitive species that have the potential to occur within the planning area.

Spotted Bat

The spotted bat (*Euderma maculatum*) is a wide-ranging western species that has a patchy distribution throughout its range and is highly associated with prominent rock formations. Its distribution is scattered throughout Nevada and linked to the availability of cliff roosting habitat (Bradley et al. 2006). This species has been in dry, rough, desert terrain and is also found in caves or cave-like situations (Watkins 1977). It is generally believed that this species forages primarily on moths. In desert or desert-like settings similar to the planning area, foraging typically occurs in canyons, over open country, or over riparian vegetation (Bradley et al. 2006). Predators of the spotted bat include kestrels, peregrine falcons, and red-tailed hawks (Watkins 1977). The spotted bat is known to roost in cliff faces and forage alone in a variety of habitats, being most active over marshes and in open ponderosa-pine woodland. Foraging bats fly 16 to 50 feet above the ground. The spotted bat may be locally abundant but it is considered rare over its geographic range.

Western (Pale Townsend's) Big-eared Bat

The western (Pale Townsend's) big-eared bat (*Corynorhinus (=Plecotus) townsendii pallescens*) is found throughout the western US, including the Intermountain Region. It is found throughout Nevada, from low desert to high mountain habitats. The Townsend's big-eared bat distribution is strongly correlated with the availability of caves and abandoned mines (Bradley et al. 2006). It is not found in the subalpine and alpine habitats (CDFG 1990). Females can breed in their first fall, and breeding occurs between October and February, coinciding with hibernation. Young are born in late spring or early summer. These bats have nurseries (12 to 200 individuals) where the female and young roost communally, and, by August, juvenile dispersal typically occurs. The bats use a wide variety of habitats from sea level to 10,000 feet. Juniper/pine and mixed coniferous forests are commonly used. Roosting occurs in caves, mine shafts, abandoned buildings and rocky outcrops during the winter. Hibernation sites are cold but not below freezing. Hibernation occurs from October to April. These bats do not migrate but move to different roost sites. During breeding, non-breeding females and males roost alone (USDA 1991). Townsend big-eared bats feed primarily on moths and may travel large distances to find food (Bradley et al. 2006). Foraging activity occurs primarily over open forests of pinyon/juniper, mahogany, white fir, aspen and cottonwood.

North American Wolverine

The North American wolverine (*Gulo gulo luteus*) has been extirpated from most of its range in the contiguous US, with an estimated fewer than 750 individuals. This includes an estimated 400 to 600 wolverines in the northern Rocky Mountains and 100 across the northwest and Sierra Nevada (NatureServe 2011). Wolverines predominately use coniferous forest types, but they also use non-forest alpine habitats (USDA 2001). Wolverines have not been confirmed in the state since 1936 and are most likely extirpated, although occasional unconfirmed reports persist (Wildlife Action Plan Team 2006). Aubry et al.

(2007) found that wolverines are most likely to be found in alpine habitats that have snow cover that persists into spring denning season. Den sites include caves, boulder talus, fallen trees, hollow logs, cavities in the ground under rocks, and complex snow tunnels (Magoun and Copeland 1998; Zeiner et al. 1990). Wolverines feed primarily on small mammals and carrion. Wolverines probably mate from May to July, with young born from January through April. The species could occur on the Bridgeport Ranger District and is unlikely to occur in any other Humboldt-Toiyabe National Forest Ranger Districts within the planning area.

Pygmy Rabbit

The pygmy rabbit (*Brachylagus idahoensis*) is the smallest of all North American rabbits. It is found in central and northern Nevada, corresponding to sagebrush distribution (Wildlife Action Plan Team 2006). The pygmy rabbit is largely dependent upon sagebrush (primarily big sagebrush, *Artemisia tridentata*), but is usually found in areas where big sagebrush grows in very dense stands. Within these stands of dense sagebrush, it selects sites that have the greatest cover densities (USDA 2001). The pygmy rabbit will not cross even moderately large areas of open ground. Burrows are usually under big sagebrush and only rarely located in an opening in the vegetation. Generally soft, deep soils are required for burrowing. They also use the contours of the soil, most often digging into a slope. Breeding ranges from late February to early May with young born from March to early August (CDFG 1980). Females are able to produce three litters per year and therefore breeding is often extended into the summer (USDA 2001).

Desert Bighorn Sheep

Desert bighorn sheep (*Ovis canadensis nelsoni*) is a subspecies of bighorn sheep that is found in Nevada, Arizona, California, Oregon, and Utah (NatureServe 2011). It is found in southern and central Nevada in grasslands or shrub-steppe in mountains, foothills, or river canyons (Wildlife Action Plan Team 2006). Escape terrain (e.g., cliffs, talus slopes) is an important feature and features that restrict vision (e.g., dense forest or chaparral) are generally avoided. Desert bighorn sheep typically migrate between an alpine or montane summer range and a lower elevation winter range. Similarly, the species diet varies seasonally. Bighorn sheep primarily graze on grass and forbs, but may also consume shrubs. Mating season varies throughout the species range and may occur from July through January. Lambing generally peaks in May (Wildlife Action Plan Team 2006).

The species in Nevada is composed of several disjunct populations, which make bighorn sheep susceptible to predation and disease. Carrying capacity throughout the range may be reduced through grazing by other ungulates, such as cattle and burros. Disease transmission via domestic sheep is believed to cause mortality. In some areas, lungworm infections may predispose bighorn

sheep to respiratory infection by opportunistic bacteria (Wildlife Action Plan Team 2006).

Bald Eagle

The bald eagle (*Haliaeetus leucocephalus*) is found throughout the US and Canada. The species inhabits Nevada primarily during the winter; nesting locations are limited (GBBO 2010). Winter roost sites are often located near unfrozen lakes and reservoirs; however, they may use sites farther from water if they are protected from weather extremes, such as high elevation coniferous forest (GBBO 2010). Conifers are preferred for winter roost sites, but deciduous trees may also be used. Nests are built in tall trees usually in an open canopy area and/or near the forest edge, and usually less than one mile from a lake, river, or other water body. Primary habitats used in Nevada include open water and Great Basin and Mojave lowland riparian. Preferred prey is fish, but bald eagles also eat carrion, small mammals, and waterfowl (GBBO 2010).

The main habitat threats for bald eagle are loss of suitable nest and roost trees or forest patches in proximity to large water bodies; human activity close to nest sites and winter roosts, which can cause nest or roost abandonment, interfere with required activity patterns, or prevent eagles from attempting to breed in otherwise suitable locations; and bio-accumulated mercury from fish or exposure to pesticides, which may interfere with reproduction or cause direct mortality (GBBO 2010).

Mountain Quail

The mountain quail (*Oerortyx pictus*) is the largest North American quail and is a resident from southwestern British Columbia, western and southern Washington, central Idaho south through the mountains of California and western Nevada (Johnsgard 1973). The species has a patchy distribution throughout montane areas of western Nevada (GBBO 2010). It is found on the Bridgeport Ranger District and does not occur in any other Humboldt-Toiyabe National Forest Ranger Districts within the planning area. Ideal conditions are likely steep landscapes, where intact coniferous forests, deciduous woodlands, and montane shrublands exist in close proximity to a stream (GBBO 2010). Primary habitats used in Nevada include montane riparian, aspen, montane shrubland, and coniferous forest (GBBO 2010). Mountain quails are ground foragers, eating mainly seeds, fruits and flowers, and terrestrial arthropods during nesting season (GBBO 2010).

This species often nests in high elevations up to 10,000 feet, migrating to lower elevation in the fall (Terres 1980). However, Pope and Crawford (1999) found that mountain quail do not always migrate between seasons and will often nest within their winter range. Mountain quail appear to be opportunistic nesters utilizing a wide variety of habitat types for breeding. Nests are often concealed under logs or fallen pine branches, in weeds, shrubs, or at the base of large trees. Brennan et al. (1987) found that mountain quail usually nest within a few

hundred yards of water to provide chicks with required water supply after hatching. However, recent studies suggest proximity to water source may not always be important in selection of breeding habitat. Young mountain quail may receive sufficient hydration from vegetation sources found in non-riparian areas (Pope and Crawford 1999; Pope 2003).

Mountain quail often use habitats on steep slopes and seem to prefer slopes that are 20 percent or steeper. Although slope may not be a requirement for mountain quail, these birds may use steep slopes to avoid or escape from predators by running uphill when pursued. Open habitats such as annual grasslands, lava flows, and talus slopes are infrequently used by this species, and mountain quail will avoid crossing such habitat types. (Vogel and Reese 1995)

The main habitat threat to mountain quail is degradation of montane riparian and shrubland habitats due to sustained livestock grazing; large, intense fires; invasive plants; water diversions; and fuel reduction projects (GBBO 2010).

Flammulated Owl

Flammulated owls (*Otus flammeolus*) are migratory, wintering in Mexico and returning to the US in late April to early May (McCallum 1994). The species distribution in Nevada is not well understood; it has been recorded in the Santa Rosa, Jarbidge, Spring, Schell Creek, Quinn Canyon, White Pine, Sheep, Clover, Snake, Highland, Bull Run, and Carson ranges. In Nevada, they are known to breed from late may until early August in mature coniferous forests and aspen groves (GBBO 2010). They occur in montane regions from 6,000 to 10,000 feet elevation and favor small openings, edges, and clearings with snags for nesting and roosting habitat. Nests are located in large woodpecker cavities in large snags within 100 to 330 feet of a forest opening (GBBO 2010). Plant composition in preferred habitat includes ponderosa and Jeffrey pines, white fir, mix of other coniferous species, or aspen, and the species prefers a well-developed shrub understory in forest stands (GBBO 2010). They forage almost exclusively on insects and other arthropods, mostly moths, beetles, and grasshoppers.

Habitat threats to the species include loss of large snags to fuel gathering, fuels reduction activities, or large, high-severity fires; and simplification of the forest mosaic as a result of large, high-severity fires. Recent genetic studies suggest that Nevada populations may be smaller, more isolated, and less stable than others in the West (GBBO 2010).

California Spotted Owl

The California spotted owl (*Strix occidentalis occidentalis*) is one of three sub-species of spotted owl, and is found in the Sierra Nevada within the Bridgeport Ranger District. It does not occur in any other Humboldt-Toiyabe National Forest Ranger Districts within the planning area. Commonly inhabited plant associations include ponderosa pine, Douglas-fir, and white fir (Wildlife Action Plan Team 2006). In general, stands suitable for California spotted owl foraging

have 1) at least two canopy layers, 2) dominant and co-dominant trees in the canopy averaging at least eleven inches in diameter at breast height, 3) at least 40 percent canopy cover in overstory trees, and 4) higher than average numbers of snags and downed woody material (USDA 2001). Stands suitable for nesting and roosting have 1) two or more canopy layers, 2) dominant and codominant trees in the canopy averaging at least 24 inches in diameter at breast height, 3) at least 70 percent total canopy cover, 4) higher than average levels of very large, old trees, and 5) higher than average levels of snags and downed woody material (USDA 2001). Elevation range for this species is sea level to 7600 feet (Zeiner et al. 1990).

Northern Goshawk

The northern goshawk is found throughout most of North America, with a few isolated populations in the southeastern and central US. The species is found year-round in Nevada; the population estimate is approximately 700 birds. Goshawks select nesting sites based on forest structure and usually nest in mature aspen stands (less commonly in coniferous stands) in trees 33 to 50 feet tall. Winter habitat use is poorly understood, but data indicate that goshawks may wander within a radius of 95 miles during the post-breeding season (GBBO 2010).

Known breeding dates in Nevada are from early April through August (GBBO 2010). There is usually a single pair per aspen patch (GBBO 2010). Stick nests are often built in trees on north or northwest facing slopes of less than 30 percent slope and near water (Reynolds et al. 1992). Goshawks prey on a variety of species, particularly small mammals and birds. Foraging occurs in heavily canopied forests with open understories. Goshawks generally use perches to identify prey while hunting.

Protected Activity Centers are identified to include the latest documented nest site and location of alternate nests (USDA 2001). Protected Activity Centers encompass the best available 200 acres of forested habitat which include: 1) two or more canopy layers; 2) trees in the dominant and co-dominant crown classes averaging 24 inches in diameter at breast height or greater; 3) in eastside pine forest types, stands have at least 60 percent tree canopy cover.

Habitat and other threats to northern goshawks include:

- Loss or degradation of mature aspen stands, which may be caused by:
  - Livestock or other ungulate grazing and browsing that prevents stand regeneration or removes understory vegetation;
  - Tree pathogens or Aspen Decline Syndrome;
  - Stand-wide fires that destroy suitable nesting trees; or
  - Invasion and eventual replacement of aspen stands by conifers;

- Illegal take of eggs or nestlings for falconry; and
- Human recreational activity in proximity to nest sites (GBBO 2010).

Greater Sage-Grouse

Greater sage-grouse rely primarily on sagebrush to meet its life requirements (forage, cover, and breeding). It is found year-round in Nevada, and the state is home to roughly half of the global sage-grouse population (GBBO 2010). The bi-state distinct population segment comprises a genetically unique metapopulation of greater sage-grouse that defines the far southwestern limit of the species' range. It consists of several relatively small, localized breeding populations distributed among suitable sagebrush habitats in portions of western Nevada and eastern California (Bi-State Technical Advisory Committee 2012). The bi-state distinct population segment is found throughout the Bridgeport Geothermal Decision Area, while the range-wide population of greater sage-grouse could occur in the three other decision areas. Leks, or breeding display sites, typically occur in open areas surrounded by sagebrush; these sites include, but are not limited to, landing strips, old lakebeds, low sagebrush flats and ridge tops, roads, cropland, and burned areas (Connelly et al. 2000). A common feature of leks sites is that they have less herbaceous and shrubcover than surrounding habitats (Schroeder et al. 1999). Breeding occurs from March to early April and young hatch in early April to late July (Schroeder et al. 1999). The nest site tends to be in sagebrush stands with the mean height of 11 to 31 inches, and nests tend to be under the tallest sagebrush in the stand (Connelly et al. 2000).

Sage-grouse leks in this area are located above 8,800 feet in elevation, near high quality nesting habitat (Bi-State Local Planning Group 2004). High quality nesting habitat is characterized by primarily Wyoming big sagebrush communities that have 15 to 38 percent canopy cover and a grass and forb understory. Residual cover of grasses may also be important, ranging from three to 30 percent at successful nest sites. Brood meadows mostly occur between 8,000 and 9,000 feet, where plants have a short growing season.

Brood-rearing areas include primarily sagebrush, riparian meadows which are rich in forbs and insects. Sage-grouse will also raise their young in greasewood bottoms, alfalfa and grain fields, irrigated pastures, and trails. Winter ranges are dominated by 6 to 43 percent cover of sagebrush, primarily big sagebrush, low sagebrush, or silver sagebrush (Schroeder et al. 1999). Sagebrush is essential for sage-grouse survival in the winter and dominates their diet during late autumn, winter and early spring. Insects, beetles, and ants as well as a variety of forbs are important forage to developing juveniles.

As presented in the Greater Sage-Grouse Management Plan for Nevada and Eastern California, the greatest threats to greater sage-grouse are:

- Loss of habitat to:

  - Fire,
  - Pinyon-juniper encroachment;
- Decline in habitat quality due to:
  - Invasive plants,
  - Inadequate grazing management systems, which can particularly impact brood-rearing meadows;
- Fragmentation of landscapes and simplification of the flora across landscapes. This process can reduce availability of, or connectivity between, seasonally important habitats;
- Energy (solar and wind) development;
- Raven predation of eggs and young may be high in some areas; and
- Sage-grouse are vulnerable to adult mortality from West Nile virus, but the disease's overall impacts in Nevada are not yet known (GBBO 2010).

Over the past decade, land managers have worked to reduce threats to the bi-state distinct population segment, including land acquisitions to reduce urbanization, road closures, removal or modification of fences, modification of livestock grazing permits, wild horse gathers, treatment of pinyon and juniper encroachment, fuel reduction projects, and research (Bi-State Technical Advisory Committee 2012). The BLM has released interim conservation measures for sage-grouse (BLM 2011d) and is working with the Forest Service to amend land use plans to incorporate sage-grouse conservation measures. The BLM formed the Sage-Grouse National Technical Team to help inform this process and prepared a report recommending conservation measures to protect sage-grouse habitat from anthropogenic disturbances (Sage-Grouse National Technical Team 2011). As stated in Chapter 2, in March 2012, NDOW released their broad scale habitat category maps for greater sage-grouse (NDOW 2012). Figures 2-7 and 2-8 show the five categories as they pertain to the decision areas.

Peregrine Falcon

The peregrine falcon (*Falco peregrinus*) breeds on every continent except Antarctica and is found throughout the US (NatureServe 2011). Within northern Nevada, the species is found during migration, though breeding is known from southern Nevada near Lake Mead. However, new nesting territories are discovered every year, progressively farther from the core Lake Mead population center. Marshes and nearby uplands throughout much of the state are used as foraging sites by migrating falcons. The species flies and forages over many habitat types, but these are usually near cliffs or elevated nesting sites and suitable prey populations (GBBO 2010). Peregrine falcons prey on mid- to small-sized birds and occasionally bats or other mammals (GBBO 2010).

Threats to the species include wind and solar energy development, which may impact foraging areas, as well as nest disturbance, illegal or legal falconry take, or persecution (GBBO 2010).

Plants

Table 3-7, Forest Service Sensitive Plant Species with the Potential to Occur within the Planning Area, shows the Forest Service Sensitive plant species with the potential to occur within the planning area.

Table 3-7
Forest Service Sensitive Plant Species with the Potential to Occur within the Planning Area

Species	Habitat Preference	Potential Habitat in Decision Area?	Documented within Ranger District? (Y/N)
Bodie Hills rockcress (*Arabis bodiensis*)	Dry, open, rocky, high or north-facing slopes, or exposed summits of granitic or rhyolitic material, between 6,720 and 9,970 feet in elevation. Pinyon-juniper and sagebrush associate. Known in Nevada from the Wassuk Range, Brawley Peaks, and Bodie Hills, Mineral County.	Bridgeport	Y - Six occurrences on the Bridgeport Ranger District
Eastwood milkweed (*Asclepias eastwoodiana*)	In open areas on a wide variety of basic soils, frequently in small washes or other moisture-accumulating microsites. Grows in the shadscale, mixed-shrub, sagebrush, and lower pinyon-juniper zones between 4,680 and 7,080 feet elevation. Endemic to Nevada and found in Esmeralda, Lander, Lincoln, and Nye Counties.	Ely Austin Tonopah	Y – documented from Tonopah and Ely Ranger Districts
Long Valley milkvetch (*Astragalus johannis-howellii*)	Sandy rhyolitic soils on flats and gentle slope; Usually found in swales of former or present hot springs activity between 6,700 and 8,400 feet in elevation. Found in Mineral County.	Bridgeport	Y – 5 occurrences on the Bridgeport Ranger District.
Broad-pod freckled milkvetch (*Astragalus lentiginosus* var. *latus*)	Gravelly or sandy calcareous soils, generally on moderate to steep slopes between 5,700 and 9,900 feet elevation. Endemic to Nevada and found in Elko and White Pine Counties.	Ely	Y – documented on the Ely Ranger District
Lavin's egg milkvetch (*Astragalus oophorus* var. *lavinii*)	Relatively barren slopes, knolls, badlands, or outcrops, derived from volcanic ash or carbonate, usually on northeast to southeast aspects. Grows between 5,700 and 7,467 feet in elevation in Douglas, Lyon, and possibly Mineral Counties.	Bridgeport	Y – 10 occurrences on the Bridgeport Ranger District.

Table 3-7
Forest Service Sensitive Plant Species with the Potential to Occur within the Planning Area

Species	Habitat Preference	Potential Habitat in Decision Area?	Documented within Ranger District? (Y/N)
Currant milkvetch (*Astragalus uncialis*)	Dry, open, sparsely-vegetated soils on flats and gentle slopes of hillsides and alluvial fans (4,800 to 6,050 feet). Found in Nye County.	Ely	N
Toquima milkvetch (*Astragalus toquimanus*)	Dry, stiff, sandy to gravelly soils in pinyon-juniper and sagebrush habitats between 6,480 and 7,520 feet elevation. Endemic to Nevada and found in Nye County.	Austin Tonopah	N
Upswept moonwort (*Botrychium ascendens*)	Widespread distribution and habitats, though often in riparian areas such as seeps, springs, and meadows from 7,900 to over 11,000 feet in elevation.	Bridgeport Ely Austin Tonopah	N
Dainty moonwort (*Botrychium crenulatum*)	Widespread distribution and habitats, though often in riparian areas such as seeps, springs, and meadows from 7,900 to over 11,000 feet in elevation. Likely present in isolated pockets in many of the higher and wetter mountains of Nevada.	Bridgeport Ely Austin Tonopah	N
Slender moonwort (*Botrychium lineare*)	Riparian areas such as seeps, springs, and meadows from 7,900 to over 11,000 feet in elevation.	All Decision Areas	N
Moosewort (*Botrychium tunux*)	Riparian areas such as seeps, springs, and meadows from 7,900 to over 11,000 feet in elevation.	All Decision Areas	N
Tioga Pass sedge (*Carex tiogana*)	On terraces next to lakes, meadows, and other mesic sites. Can occur with *Salix nivalis*. Found from 10,100 to 10,900 feet in elevation.	Bridgeport	N
Bodie Hills draba (*Cusickiella quadricostata*)	Clay or rocky soils on flats and rolling hills. Usually found at middle to high mountain (6,000 to 8,500 feet) on flats, ridges, and windswept slopes. Found in Douglas, Lyon, and Mineral Counties.	Bridgeport	Y - Six occurrences on the Bridgeport Ranger District.
Star draba (*Draba asterophora* var. *asterophora*)	Subalpine conifer area. Found on granite rock crevices, talus, scree, or rocky decomposed granite or volcanic soils on steep slopes, mostly on north to east aspects. Grows between 8,000 to 10,200 feet in elevation in Washoe County.	Bridgeport	N
Pennell draba (*Draba pennellii*)	Cliffs, outcrops, and ridges in pinyon-juniper, subalpine, and alpine zones.	Ely	N

Table 3-7
Forest Service Sensitive Plant Species with the Potential to Occur within the Planning Area

Species	Habitat Preference	Potential Habitat in Decision Area?	Documented within Ranger District? (Y/N)
Toiyabe buckwheat (*Eriogonum esmeraldense* var. *toiyabense*)	Generally steep, loose, sandy to gravelly or clay slopes, frequently on white ash deposits, in the pinyon-juniper, mountain sagebrush, mountain mahogany, and subalpine conifer zones (7,200 to 9,240 feet). Endemic to Eureka, Lander, and Nye Counties.	Austin Tonopah	Y – Documented on the Austin and Tonopah Ranger Districts
Lewis's buckwheat (*Eriogonum lewisii*)	Found in sagebrush habitat between 6,470 and 9,720 feet elevation.	Ely	N
Webber ivesia (*Ivesia webberi*)	Low sagebrush between 4,000 and 5,950 feet elevation. In full sun of gentle slopes in sparsely vegetated areas. Known in Nevada from the Pine Nut and Carson ranges and Peavine Mountain.	Bridgeport	N
Three-ranked hump-moss (*Meesia triquetra*)	Found in bog, fen, and spring associate between 4,300 and 9,700 feet in elevation.	Bridgeport	N
Shevock rockmoss (*Orthotrichum shevockii*)	Dry granitic rocks from 3,600 to 5,300 feet elevation.	Bridgeport	N
Elegant penstemon (*Penstemon concinnus*)	Habitat information unknown. Two occurrences mapped in Lincoln and White Pine Counties between 6,200 and 6,600 feet elevation.	Ely	N
Wassuk beardtongue (*Penstemon rubicundus*)	Open, rocky to gravelly soils on perched tufa shores, steep decomposed granite slopes, rocky drainage bottoms, and roadsides or other recovering disturbances with enhanced runoff, locally abundant on recent burns. Grows between 4,200 and 6,850 feet elevation in Douglas, Mineral, and possibly Esmeralda Counties.	Bridgeport	Y – 4 occurrences on the Bridgeport Ranger District.
Mono phacelia (*Phacelia monoensis*)	Alkaline, barren or sparsely vegetated shrink-swell clays mostly of andesitic origin, on various slopes and aspects. Often found in disturbed areas in habitat and eroding badlands. Grows between 6,000 to 9,000 feet elevation in Esmeralda, Lyon, and Mineral Counties.	Bridgeport	Y – 19 occurrences on the Bridgeport Ranger District.
Altered andesite popcorn flower (*Plagiobothrys glomeratus*)	Dry, shallow, acidic, gravelly clay soils, mostly of the Smallcone series. Yellowish to orange brown patches on ridges, knolls, and steep slopes on all aspects. Grows between 4,850 and 6,650 feet elevation in Storey and Washoe Counties.	Bridgeport	N

Table 3-7
Forest Service Sensitive Plant Species with the Potential to Occur within the Planning Area

Species	Habitat Preference	Potential Habitat in Decision Area?	Documented within Ranger District? (Y/N)
White Mountain skypilot (*Polemonium chartaceum*)	Alpine boulder and rock field, subalpine coniferous forest, soil rocky, serpentine, granitic, or volcanic. Grows between 5,900 to 13,700 feet elevation. In Nevada known only from near the summit of Boundary Peak in the White Mountains in Esmeralda County.	Bridgeport	N
Williams combleaf (*Polyctenium williamsii*)	Relatively barren margins or bottoms of non-alkaline seasonal lakes between 5,600 and 8,900 feet elevation. Found in Douglas, Lyon, Mineral, Nye, and Washoe Counties.	Bridgeport	Y – 12 occurrences on the Bridgeport Ranger District.
Sagebrush cinquefoil (*Potentilla johnstonii*)	Known from a single site in the Quinn Canyon Range of Nevada at 7,600 feet elevation.	Ely	N
Mono ragwort (*Senecio pattersonensis*)	Open, rocky habitats, including talus slopes and gravelly ridges at and above timberline and alpine fell-field areas. Found between 9,500 and 12,200 feet elevation.	Bridgeport	N
Masonic Mountain jewelflower (*Streptanthus oliganthus*)	Found on rocky slopes or talus, on flat areas, in ravines, and in canyon bottoms in sandy or gravelly soil of decayed granite or decomposing volcanic rock. Sometimes associated with large outcroppings. Grows between 6,400 and 10,000 feet elevation in Esmeralda, Lyon, and Mineral Counties.	Bridgeport	Y – 12 occurrences on the Bridgeport Ranger District.
Currant Summit clover (*Trifolium andinum* var. *podocephalum*)	Crevices of volcanic or carbonate rock in the pinyon-juniper zone (6,900 to 7,000 feet). Endemic to the White Pine and Egan ranges in Lincoln and Nye Counties.	Ely	Y – documented on the Ely Ranger District

Sources: Morefield 2001; NatureServe 2011

3.13.1 Bridgeport Geothermal Decision Area

Lahontan Cutthroat Trout

It is stated in the Lahontan Cutthroat Trout Walker River Recovery and Implementation Team Restoration and Recovery Strategy and Short-Term Action Plan that Bodie and Rough Creeks are tributaries to the East Walker River. The Short-Term Action Plan states the Lahontan Cutthroat Trout Walker River Recovery and Implementation Team continue to consider all

historically occupied habitats within the decision area as areas that may be important to the recovery of the species in the Walker River Basin. Streams within the decision area that are specifically addressed in the 1995 Lahontan Cutthroat Trout Recovery Plan include Bodie and Rough Creeks; Bodie Creek as a "Current or Recently Existing Population" and Rough Creek as a possible re-introduction site. There are currently no Lahontan cutthroat trout present in this area.

Spotted Bat

Roosting habitat may occur within the decision area on rocky outcrops or in caves, abandoned structures, or old mining shafts. There is also potential foraging habitat for spotted bat within the decision area. Surveys have not been conducted throughout the entire decision area and species occurrence is unknown; however, bat surveys have been conducted at Chemung and Borealis mining locations in 2005 and 2006. No spotted bats were observed at these sites (JBR Environmental Consultants 2005; Faught 2005).

Western (Pale Townsend's) Big-eared Bat

Roosting habitat may occur within the decision area on rocky outcrops or in caves, abandoned structures, or old mining shafts. There is also potential foraging habitat for Townsend's big-eared bat within the decision area. Surveys have not been conducted throughout the entire decision area and species occurrence is unknown; however, bat surveys have occurred at Chemung and Borealis mining locations in 2005 and 2006. One Townsend's big-eared bat was located at the Borealis site, but the correct species could not be verified (JBR Environmental Consultants 2005). No Townsend's big-eared bats were observed at the Chemung Mine site (Faught 2005).

North American Wolverine

There have been six unverified wolverine observations reported on the decision area, dating from 1921 to 1973 (CDFG 2009). Historically, the wolverine was a scarce resident of the North Coast mountains and the Sierra Nevada. Potential suitable habitat for wolverine may be found in the high elevation coniferous forests in the decision area.

Pygmy Rabbit

Pygmy rabbit surveys occurred on portions of the decision area in 2005 within the Bodie Hills area. These surveys did not detect any pygmy rabbits on National Forest System lands. However, a pygmy rabbit was detected near Bodie State Park. It is possible that pygmy rabbits could occur throughout the decision area where suitable habitat exists.

Desert Bighorn Sheep

Occupied bighorn sheep distribution exists in the central part of the decision area and a small portion of the southern portion of the decision area and three-mile buffer area (NDOW 2011b).

Bald Eagle

The bald eagle distribution includes the decision area and three-mile buffer, and bald eagle has been directly observed in the vicinity of the decision area. No known bald eagle nests exist within ten miles of the decision area (NDOW 2011b), and no winter roosting habitat is within the decision area.

Mountain Quail

Potential mountain quail habitat is found within the pinyon-juniper communities located adjacent to and within the decision area. Mountain quail have been observed in the Aurora area; however, the population trend is unknown within the decision area.

Flammulated Owl

Flammulated owl nesting is undocumented on the decision area. Suitable habitat does occur in coniferous forest within the decision area.

California Spotted Owl

The California spotted owl has been directly observed in the vicinity of the decision area (NDOW 2011b). However, no suitable habitat exists within the decision area. As such, the species is unlikely to occur.

Northern Goshawk

Northern goshawk distribution includes the decision area, and the species has been directly observed in the vicinity of the decision area. One northern goshawk nest has been identified in the vicinity of the decision area (NDOW 2011b).

Greater Sage-Grouse

Greater sage-grouse summer and winter distributions and nesting habitat exist throughout the central and northwestern portions of the decision area and three-mile buffer area. Sage-grouse core breeding habitat exists in sagebrush habitat in the central and western portions of the decision area and three-mile buffer area. There are 31 known greater sage-grouse lek sites in the vicinity of the decision area (NDOW 2011a).

Peregrine Falcon

Peregrine falcon distribution includes the decision area, and the species has been directly observed in the vicinity of the decision area. No known peregrine falcon nests have been recorded within the decision area or vicinity (NDOW 2011b).

3.13.2 Austin Geothermal Decision Area

Lahontan Cutthroat Trout

Lahontan cutthroat trout are considered unlikely to occur within the Austin Geothermal Decision Area, as no suitable habitat exists and the area is outside the historic range of the species.

Spotted Bat
Based on SWReGAP landcover types and topographical maps, there do not appear to be caves or cliffs within the decision area. However, the decision area likely provides potential foraging habitat for spotted bat.

Western (Pale Townsend's) Big-eared Bat
Based on SWReGAP landcover types and topographical maps, there does not appear to be suitable roosting habitat within the decision area. However, the decision area likely provides potential foraging habitat for Townsend's big-eared bat.

Pygmy Rabbit
Most of the decision area is composed of either big sagebrush shrubland or mixed sagebrush shrubland, and as such, may provide potential habitat for pygmy rabbit. Habitat suitability depends on the density of sagebrush within the decision area, which is currently unknown.

Desert Bighorn Sheep
There is no known bighorn sheep distribution in the vicinity of the decision area (NDOW 2011b).

Bald Eagle
The bald eagle distribution includes the decision area and three-mile buffer, although no known bald eagle nests exist within ten miles of the decision area (NDOW 2011b). Based on the habitat types within the decision area, bald eagles could potentially use the decision area for foraging. The decision area is unlikely to provide suitable winter roosting habitat for bald eagles.

Flammulated Owl
The flammulated owl's range within Nevada does not include the decision area; as such, the species is unlikely to occur in this area.

Northern Goshawk
Northern goshawk distribution includes the Austin Ranger District decision area. However, no known observation of the species or nests exists within the vicinity of the decision area (NDOW 2011b). Based on the SWReGAP landcover types, there is no potential goshawk nesting or foraging habitat within the decision area.

Greater Sage-Grouse
Greater sage-grouse summer and winter distributions exist throughout the entire decision area and within the three-mile buffer. Sage-grouse nesting habitat covers the northeastern corner of the decision area and covers most of the northern and eastern portions of the three-mile buffer area. Core breeding habitat exists in sagebrush habitat in the northern and southeastern portions of the three-mile buffer area. There are six known greater sage-grouse lek sites in the vicinity of the decision area (NDOW 2011a).

Peregrine Falcon
Peregrine falcon distribution includes the decision area. However, no known occurrence of the species or nests has been recorded within the decision area (NDOW 2011b). Based on the SWReGAP landcover types, the species is unlikely to nest or forage within the decision area.

3.13.3 Ely Geothermal Decision Area

Spotted Bat
Based on SWReGAP landcover types and topographical maps, there do not appear to be caves or cliffs within the decision area. However, the decision area likely provides potential foraging habitat for spotted bat.

Western (Pale Townsend's) Big-eared Bat
Based on SWReGAP landcover types and topographical maps, there does not appear to be suitable roosting habitat within the decision area. However, the decision area likely provides potential foraging habitat for Townsend's big-eared bat.

Pygmy Rabbit
The eastern half of the decision area is composed of either big sagebrush shrubland or mixed sagebrush shrubland, and as such, may provide potential habitat for pygmy rabbit. Habitat suitability depends on the density of sagebrush within the decision area, which is currently unknown.

Desert Bighorn Sheep
Bighorn sheep distribution exists in the southwest corner of the three-mile buffer around the decision area (NDOW 2011b). There are no steep slopes in the decision area, but the habitats could be used for bighorn foraging.

Bald Eagle
The bald eagle distribution includes the decision area and three-mile buffer, although no known bald eagle nests exist within ten miles of the decision area (NDOW 2011b). Based on the habitat types within the decision area, bald eagles could potentially use the decision area for foraging. The decision area is unlikely to provide suitable winter roosting habitat for bald eagles.

Flammulated Owl
While flammulated owl's range within Nevada does include the decision area, suitable habitat does not occur. As such, the species is unlikely to occur within the decision area.

Northern Goshawk
Northern goshawk distribution includes the decision area. The species has been directly observed, and a nest identified, in the vicinity of the decision area (NDOW 2011b). Based on the SWReGAP landcover types, there is no potential goshawk nesting or foraging habitat within the decision area.

Greater Sage-Grouse

Greater sage-grouse winter distribution exists in the northeastern corner of the decision area, as well as the eastern half of the three-mile buffer area. Summer distribution exists in the eastern half of both the decision area and three-mile buffer. Sage-grouse nesting habitat also exists in the eastern half of the decision area and three-mile buffer, and in the southwestern corner of the three-mile buffer area. Core breeding habitat exists in sagebrush habitat in the eastern half of the decision area and three-mile buffer area. There are two known lek sites in the vicinity of the decision area (NDOW 2011a).

Peregrine Falcon

Peregrine falcon distribution includes the decision area. However, no known occurrence of the species or nests has been recorded within the decision area (NDOW 2011b). Based on the SWReGAP landcover types, the species is unlikely to nest or forage within the decision area.

3.13.4 Tonopah Geothermal Decision Area

Lahontan Cutthroat Trout

Since there are no perennial waterways in the Tonopah Geothermal Decision Area, there is no potential or occupied habitat for Lahontan cutthroat trout.

Spotted Bat

Based on SWReGAP landcover types and topographical maps, there do not appear to be caves or cliffs within the decision area. However, the decision area likely provides potential foraging habitat for spotted bat.

Western (Pale Townsend's) Big-eared Bat

Based on SWReGAP landcover types and topographical maps, there does not appear to be suitable roosting habitat within the decision area. However, the decision area likely provides potential foraging habitat for Townsend's big-eared bat.

Pygmy Rabbit

The western edge and southern portion of the decision area is composed of either big sagebrush shrubland or mixed sagebrush shrubland, and as such, may provide potential habitat for pygmy rabbit. Habitat suitability depends on the density of sagebrush within the decision area, which is currently unknown.

Desert Bighorn Sheep

Occupied bighorn sheep distribution exists throughout the entire decision area, with the exception of the northeast corner. Bighorn sheep distribution also exists throughout the western half of the three-mile buffer area (NDOW 2011b).

Bald Eagle

The bald eagle distribution includes the decision area and three-mile buffer, although no known bald eagle nests exist within ten miles of the decision area (NDOW 2011b). Based on the habitat types within the decision area, bald eagles could potentially use the decision area for foraging. The decision area is unlikely to provide suitable winter roosting habitat for bald eagles.

Flammulated Owl

The flammulated owl's range within Nevada does not include the decision area; as such, the species is unlikely to occur in the decision area.

Northern Goshawk

Northern goshawk distribution includes the decision area. However, no known observation of the species or nests exists within the vicinity of the decision area (NDOW 2011b). Based on the SWReGAP landcover types, there is no potential goshawk nesting or foraging habitat within the decision area.

Greater Sage-Grouse

Greater sage-grouse summer and winter distributions exist throughout the entire decision area and three-mile buffer area. There are no known sage-grouse nesting or core breeding habitats or lek sites in the vicinity of the decision area (NDOW 2011a).

Peregrine Falcon

Peregrine falcon distribution includes the decision area. However, no known occurrence of the species or nests has been recorded within the decision area (NDOW 2011b). Based on the SWReGAP landcover types, the species is unlikely to nest or forage within the decision area.

3.14 WILD HORSES AND BURROS

The Wild Free-Roaming Horses and Burros Act of 1971 (Public Law 92-195) declared that wild free-roaming horses and burros are living symbols of the historic and pioneer spirit of the West and that they contribute to the diversity of life forms within the nation and enrich the lives of the American people. The Humboldt-Toiyabe National Forest provides a home to approximately 800 wild horses and burros on 16 territories. Ten of these territories are located in Central Nevada on the Austin, Tonopah and Ely Ranger Districts. One territory is in the Ruby Mountains Ranger District. Bridgeport Ranger District is home to two territories, and three territories are located in the Spring Mountains National Recreation Area. These territories account for half of the populated territories managed by the Forest Service (Forest Service 2011a).

On average, a herd of 10 wild horses or burros uses about 3,600 acres, with most herd management areas occupying 10,000 to 100,000 acres or more (BLM 2007b). Annual home range (the area habitually occupied by a herd over the course of a year) is usually less than 6,178 acres but may be as large as 74,132 acres (NatureServe 2007). As wild horse numbers within a herd can increase up

to 25 percent annually, herds can affect the condition of their range and increase competitive pressure among wild horses, livestock, and wildlife.

Issues that make wild horse and burro management difficult include:

- Competition between large game animals (elk, deer, antelope) and horses;
- Herd management areas located within areas where critical soils (i.e., soils that pose salinity problems or are very susceptible to erosion) make up more than 50 percent of the area;
- Competition with livestock; and
- Illegal chasing, capturing, and harassment (BLM 2004).

Wild horses generally live in common social groups of several females led by a dominant male. Young males are expelled from the social group when they are one to three years old and form bachelor groups (NatureServe 2007). They feed on grass and grass-like plants and browse on shrubs in winter. They visit watering holes daily and may dig to water in dry river beds (NatureServe 2007). Wild horses also tend to dominate water sources, driving wildlife away (BLM 2004). They are sometimes regarded as a pest because they can foul water, compete with livestock, or displace native ungulates such as pronghorn and bighorn sheep (NatureServe 2007).

3.14.1 Bridgeport Geothermal Decision Area

There are two wild horse and burro territories in the Bridgeport Geothermal Decision Area, the Powell Mountain Territory and the Montgomery Pass Territory (see **Figure, 3-15**, Bridgeport Geothermal Decision Area Wild Horses and Burros and Grazing Allotments). The overall Powell Mountain Territory managed herd size is 29 and the Montgomery Pass Territory has a managed herd size of 75.

3.14.2 Austin Geothermal Decision Area

Wild Horse and Burro Territories are not present in the Austin Geothermal Decision Area.

3.14.3 Ely Geothermal Decision Area

Wild Horse and Burro Territories are not present in the Ely Geothermal Decision Area.

3.14.4 Tonopah Geothermal Decision Area

Wild Horse and Burro Territories are not present in the Tonopah Geothermal Decision Area.

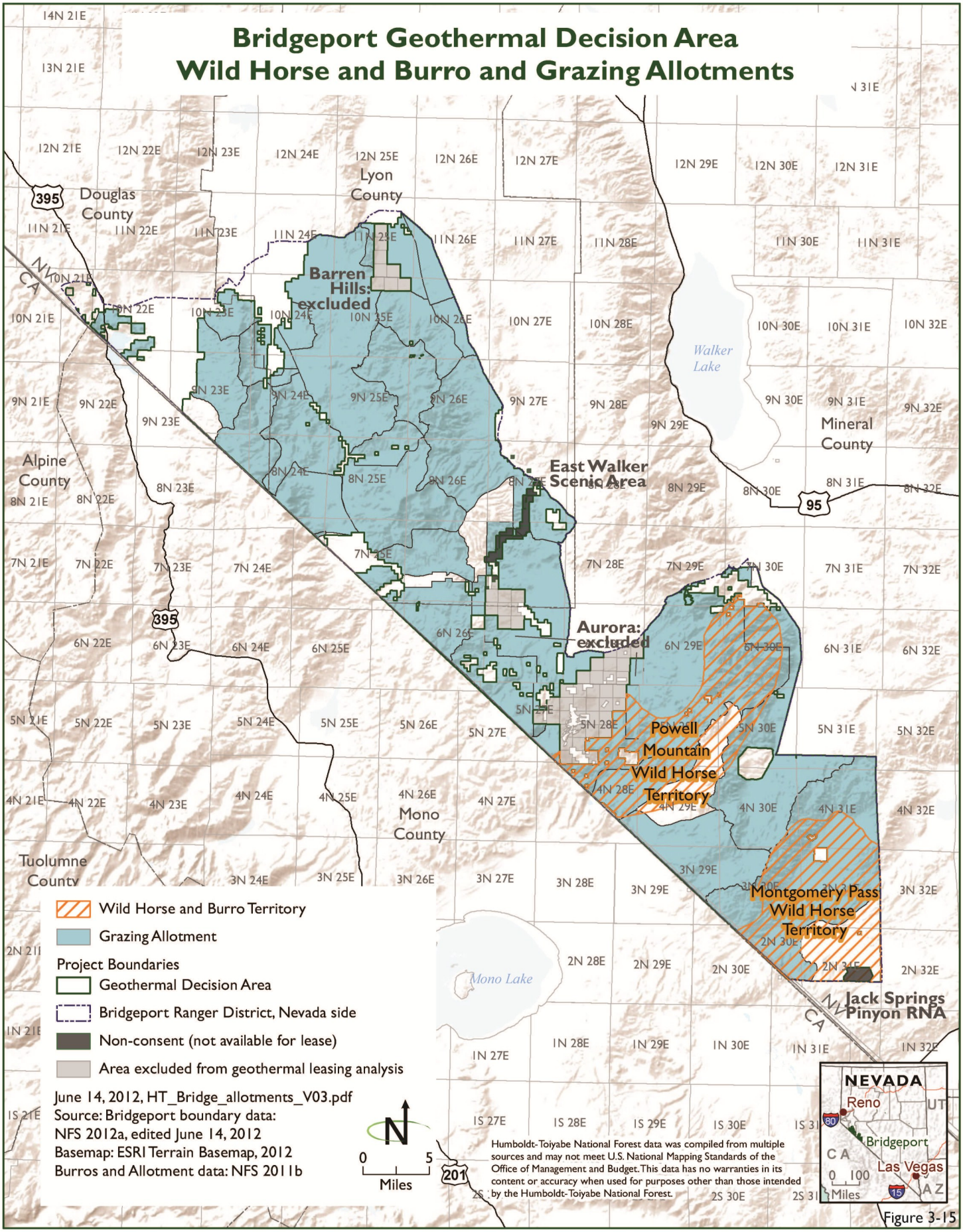

Bridgeport Geothermal Decision Area
Wild Horse and Burro and Grazing Allotments
Douglas County
Lyon County
Mineral County
Alpine County
Mono County
Tuolumne County
Barren Hills: excluded
East Walker Scenic Area
Aurora: excluded
Powell Mountain Wild Horse Territory
Montgomery Pass Wild Horse Territory
Jack Springs Pinyon RNA
Walker Lake
Mono Lake
NV
CA
395
95
201
Wild Horse and Burro Territory
Grazing Allotment
Project Boundaries
Geothermal Decision Area
Bridgeport Ranger District, Nevada side
Non-consent (not available for lease)
Area excluded from geothermal leasing analysis
June 14, 2012, HT_Bridge_allotments_V03.pdf
Source: Bridgeport boundary data: NFS 2012a, edited June 14, 2012
Basemap: ESRI Terrain Basemap, 2012
Burros and Allotment data: NFS 2011b
N
0 5
Miles
Humboldt-Toiyabe National Forest data was compiled from multiple sources and may not meet U.S. National Mapping Standards of the Office of Management and Budget. This data has no warranties in its content or accuracy when used for purposes other than those intended by the Humboldt-Toiyabe National Forest.
NEVADA
Reno
Bridgeport
CA
Las Vegas
AZ
UT
0 100
Miles

Figure 3-15

3.15 PRIME FARMLANDS

The purpose of the Farmland Protection Policy Act (Public Law 97-98, 7 USC 4201) is to minimize the extent to which federal programs contribute unnecessary and irreversible conversion of farmland to nonagricultural uses and to assure that federal programs are administered in a manner that, to the extent practicable, will be compatible with state and local government and private programs and policies to protect farmland. The term "farmland" includes all land defined as follows:

- Prime farmland is land that has the best combination of physical and chemical characteristics for producing food, feed, fiber, forage, oilseed, and other agricultural crops with minimum inputs of fuel, fertilizer, pesticides, and labor, and without intolerable soil erosion, as determined by the Secretary of Agriculture. Prime farmland includes land that possesses the above characteristics but is being used currently to produce livestock and timber. It does not include land already in or committed to urban development or water storage;
- Unique farmland is land other than prime farmland that is used for production of specific high-value food and fiber crops, as determined by the Secretary of Agriculture. It has the special combination of soil quality, location, growing season, and moisture supply needed to economically produce sustained high quality or high yields of specific crops when treated and managed according to acceptable farming methods; and
- Farmland, other than prime or unique farmland, is land of statewide or local importance of food, fiber, forage, or oilseed crops, as determined by the appropriate state or unit of local government agency or agencies, and that the Secretary of Agriculture determines should be considered as farmland for the purposes of the Farmland Protection Policy Act.

Cropland of statewide importance is land, in addition to prime farmlands, that is of statewide importance for the production of food, feed, fiber, forage, and oilseed crops. Criteria for defining and delineating this land are to be determined by the appropriate state agency or agencies. Generally, additional farmlands of statewide importance include those that are prime farmland and that economically produce high yields of crops when treated and managed according to acceptable farming methods.

Prime and unique farmlands, as well as farmlands of statewide importance are discussed for the decision areas as farmlands soils are identified and managed by local soil conservation districts. The exception is where loss of farmland soils has been identified as a regional priority. Prime and unique farmlands and

farmlands of statewide importance are discussed below for each of the decision areas.

3.15.1 Bridgeport Geothermal Decision Area

A majority of the Bridgeport Geothermal Decision Area does not have NRCS farmland designation. The decision area includes Farmlands of statewide importance, Prime farmland if irrigated, Prime farmland if irrigated and drained and Prime farmland if irrigated and reclaimed of excess salts and sodium (**Figure 3-16**, Bridgeport Geothermal Decision Area Farmland).

3.15.2 Austin Geothermal Decision Area

Lands within the Austin Geothermal Decision Area do not meet the criteria for prime farmland (Clarke 2012).

3.15.3 Ely Geothermal Decision Area

Lands within the Ely Geothermal Decision Area do not meet the criteria for prime farmland (Clarke 2012).

3.15.4 Tonopah Geothermal Decision Area

Lands within the Tonopah Geothermal Decision Area do not meet the criteria for prime farmland (Clarke 2012).

3.16 LIVESTOCK GRAZING

This section describes grazing resources and regulations for the planning area and the four decision areas.

The primary law governing grazing on National Forest System lands is the Public Rangelands Improvement Act of 1978. The three enabling statutes that govern grazing on National Forest System lands are the Organic Administration Act, the Bankhead-Jones Farm Tenant Act, and the Multiple-Use Sustained-Yield Act.

The Taylor Grazing Act directs that occupation and use of the range be regulated to preserve the land and its resources from destruction or unnecessary injury, and to provide for the orderly use, improvement, and development of the range. FLPMA provides authority and direction for managing federal lands on the basis of multiple use and sustained yield and mandates land use planning principles and procedures for federal lands. The Public Rangelands Improvement Act does the following:

- Defines rangelands as public lands on which there is domestic livestock grazing or that are suitable for livestock grazing;
- Establishes a national policy to improve the condition of public rangelands so they will become as productive as feasible for all rangeland values;
- Requires a national inventory of public rangeland conditions and trends; and

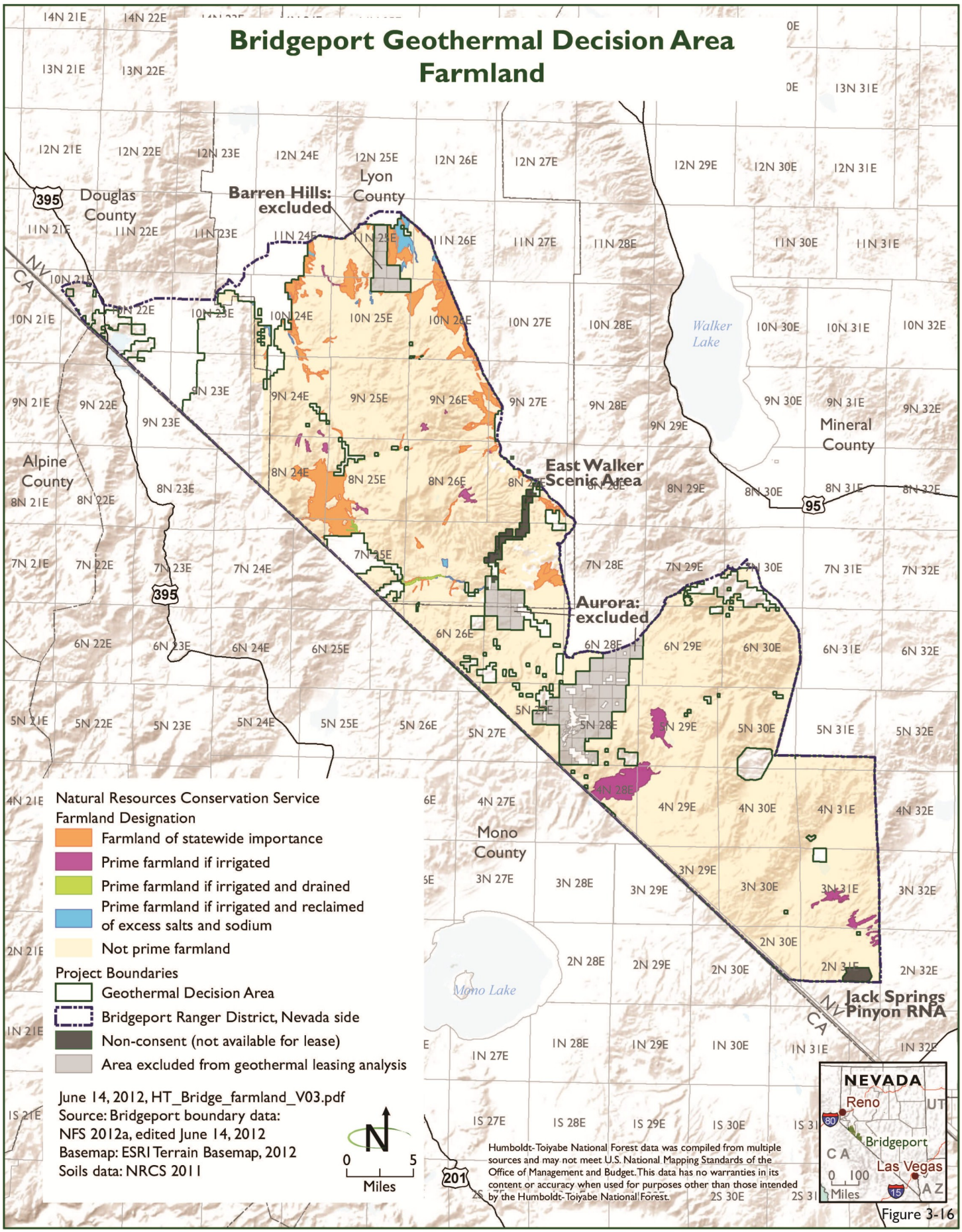

Bridgeport Geothermal Decision Area
Farmland
Barren Hills: excluded
Lyon County
Douglas County
Alpine County
Mineral County
East Walker Scenic Area
Aurora: excluded
Mono County
Walker Lake
Mono Lake
Jack Springs Pinyon RNA
NV
CA
395
95
201
Natural Resources Conservation Service
Farmland Designation
Farmland of statewide importance
Prime farmland if irrigated
Prime farmland if irrigated and drained
Prime farmland if irrigated and reclaimed of excess salts and sodium
Not prime farmland
Project Boundaries
Geothermal Decision Area
Bridgeport Ranger District, Nevada side
Non-consent (not available for lease)
Area excluded from geothermal leasing analysis
June 14, 2012, HT_Bridge_farmland_V03.pdf
Source: Bridgeport boundary data: NFS 2012a, edited June 14, 2012
Basemap: ESRI Terrain Basemap, 2012
Soils data: NRCS 2011
N
0 5
Miles
Humboldt-Toiyabe National Forest data was compiled from multiple sources and may not meet U.S. National Mapping Standards of the Office of Management and Budget. This data has no warranties in its content or accuracy when used for purposes other than those intended by the Humboldt-Toiyabe National Forest.
NEVADA
Reno
Bridgeport
CA
Las Vegas
AZ
UT
0 100
Miles

Figure 3-16

- Authorizes funding for range improvement projects.

The Forest Service primarily manages grazing and management on National Forest System lands under 36 CFR 222, Forest Service Manual 2200 – Range Management, and Forest Service Handbook 2200 – Range Management (Forest Service 2007). Under this management, ranchers may obtain a grazing permit for an allotment of public or National Forest System land on which a specified number of livestock may graze. An allotment is an area of land designated and managed for livestock grazing. The number of permitted livestock on a particular allotment on public land is determined by how many animal unit months that land will support. An animal unit month is the quantity of forage required by one mature cow and her calf (or the equivalent in sheep or horses) for one month. Upper and special limits governing the total number of livestock for which a person is entitled to hold a grazing permit on National Forest System lands is determined by the Chief of the Forest Service based factor identified in 36 CFR 222.

A total of approximately 564,129 acres of National Forest System lands are open to grazing in the planning area. There are 33 total grazing leases on National Forest System lands in the planning area. Below is a characterization of the active grazing allotments occurring in the four decision areas. Livestock Grazing Allotment data for National Forest System lands was reviewed for the decision areas below.

3.16.1 Bridgeport Geothermal Decision Area

There are 31 grazing allotments on National Forest System lands in the Bridgeport Geothermal Decision Area. **Table 3-8**, Livestock Grazing Allotments in the Bridgeport Geothermal Decision Area, outlines the active Cattle and Horse, and Sheep and Goat allotments that occur in the Bridgeport Geothermal Decision Area as well as the total acres and animal unit months (AUMs) designated for each.

3.16.2 Austin Geothermal Decision Area

The Austin Geothermal Decision Area is located within the 26,537-acre Lake Flat Allotment. There are no known active AUMS within the decision area.

3.16.3 Ely Geothermal Decision Area

The Ely Geothermal Decision Area is located within the 61,518-acre Ellison Basin Allotment. There are no known AUMS within the decision area.

3.16.4 Tonopah Geothermal Decision Area

There are no livestock grazing allotments located within or overlapping the Tonopah Geothermal Decision Area.

Table 3-8
Livestock Grazing Allotments in the Bridgeport Geothermal Decision Area

Allotment Name	Acres	AUMs
Wild Oat Sheep and Goat Allotment	2,361	260
Topaz Cattle and Horse Allotment	1,288	79
Saroni Canal Sheep and Goat Allotment	5,882	340
Risue Sheep and Goat Allotment	12,960	465
Nye County Cattle and Horse Allotment	6,823	20
Powell Mountain Cattle and Horse Allotment	60,763	898
Larkin Lake Cattle and Horse Allotment	12,757	581
Wildhorse Cattle and Horse Allotment	24,877	395
Huntoon Cattle and Horse Allotment	68,439	1,081
Gray Hills Sheep and Goat Allotment	3,689	339
Squaw Creek Cattle and Horse Allotment	1,643	0
Whiskey Flat Cattle and Horse Allotment	43,295	1,066
Wheeler Flat Cattle and Horse Allotment	5,784	656
East Walker Cattle and Horse Allotment	41,753	2,373
Masonic Cattle and Horse Allotment	15,162	186
Desert Creek Cattle and Horse Allotment	198	0
Dalzell Cattle and Horse Allotment	3,988	363
Simpson Cattle and Horse Allotment	4,795	0
Sweetwater Cattle and Horse Allotment	26,059	1,853
Four Mile Cattle and Horse Allotment	3,358	262
Rough Creek Cattle and Horse Allotment	14,663	176
Desert Peak Sheep and Goat Allotment	18,573	313
Conway Cattle and Horse Allotment	11,456	312
Sulphur Sheep and Goat Allotment	50,508	1,969
Pine Grove Sheep and Goat Allotment	17,086	302
Missouri Flat Cattle and Horse Allotment	7,230	1,095
Sugarloaf Sheep and Goat Allotment	13,342	420
Fryingpan-Murphy Creek Cattle and Horse Allotment	2,394	188
Nine Mile Cattle and Horse Allotment	37,057	3,118
Aurora Sheep and Goat Allotment	9,914	0
Bald Mountain Sheep and Goat Allotment	28,574	541

Source: Forest Service 2011a

3.17 CULTURAL RESOURCES

This section provides an overview of the laws, regulations, and policies that influence the management of cultural resources. Although some of the laws, regulations, and policies listed do not directly apply to the project, they were applied as a basis for the analysis of potential effects on cultural resources. This section also provides a cultural and historic overview of the four decision areas.

3.17.1 Regulatory Framework

Federal Laws, Regulations, Policy

National Historic Preservation Act (NHPA) of 1966 (16 USC 470) addresses preservation of historic properties, including historical and archaeological

districts, sites, buildings, structures, and objects that are eligible for listing on the National Register of Historic Places (NRHP). Section 106 of the NHPA requires federal agencies to take into account the effects of their undertakings on historic properties and seeks to accommodate historic preservation concerns with the needs of federal undertakings through consultation among the agency official, the State Historic Preservation Office, and Indian tribes. The goal of consultation is to identify historic properties potentially affected by the federal undertaking, assess effects, and seek ways to avoid, minimize or mitigate any adverse effects on historic properties. Determining any property's NRHP eligibility follows a criteria-driven evaluation procedure specified at 36 CFR Part 60.

The significance of an historic property is determined by it being at least 50 years old; its context (e.g., its place in American history, architecture, archaeology, engineering, and culture); its integrity of location, design, setting, materials, workmanship, feeling, and association; and its meeting one or more of the following four criteria:

A. association with events that have made a significant contribution to the broad patterns of our history;

B. association with the lives of persons significant in our past;

C. embodies the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction;

D. has yielded, or may be likely to yield, information important in prehistory or history.

Some properties may be eligible for the NRHP because of its historical importance to a tribe, including traditional religious and cultural importance. A 1992 amendment to the act (PL 102-575) explicitly directs that properties of traditional religious and cultural importance to an Indian tribe may be determined to be eligible for inclusion on the NRHP, and that in carrying out its responsibilities under Section 106, a federal agency shall consult with any Indian tribe that attaches religious and cultural significance to such properties.

The proposed action is an undertaking, as defined by 36 CFR 800.3, and is subject to Section 106 and consideration under other federal requirements.

Organic Act of 1897 (Title 16 USC Sections 473-478, 479-482, 551) is the original organic act governing the administration of National Forest System lands. It is one of several federal laws under which the Forest Service operates. Under this act, the Secretary of Agriculture may make regulations and establish services necessary to regulate the occupancy and use of National Forest System

lands and preserve them from destruction. Persons violating the act or regulations adopted under it are subject to fines or imprisonment. The Organic Act is one authority used to issue Permits for Archaeological Investigations.

Antiquities Act of 1906 (16 USC 431) provides for permits, for misdemeanor-level penalties for unauthorized use, and for presidential designation of national monuments for long term preservation. The Archaeological Resources Protection Act (ARPA) has replaced the Antiquities Act as the authority for special use permits if the resource involved is 100-years-old or greater. Uniform regulations at 43 CFR Part 3 implement the act.

Historic Sites Act of 1935 (16 USC 461) declares national policy to "preserve for public use historic sites, buildings, and objects of national significance for the inspiration and benefit of the people of the United States." The act authorizes the National Park Service's National Historic Landmarks Program. The National Historic Landmarks Program is implemented by regulations at 36 CFR Part 65.

The Archeological and Historic Preservation Act of 1974 (AHPA) (16 USC 469) is also known as the Archeological Recovery Act and the Moss-Bennett Bill. AHPA amended and expanded the Reservoir Salvage Act of 1960 and was enacted to complement the Historic Sites Act of 1935 by providing for the preservation of historical and archaeological data which might be lost or destroyed as the result of the construction of a federally authorized dam or other construction activity. This greatly expanded the number and range of federal agencies that had to take archeological resources into account when executing, funding, or licensing projects. AHPA also allows for any federal agency responsible for a construction project to appropriate a portion of project funds for archaeological survey, recovery, analysis, and publication of results.

Federal Land Policy and Management Act of 1976 (FLPMA), (43 USC 1701), directs the Forest Service to manage National Forest System lands on the basis of multiple use, in a manner that "recognizes the Nation's need for domestic sources of minerals, food, timber, and fiber from the public lands" and that will "protect the quality of …historical… resources, and archeological values." The act provides for the periodic inventory of public lands and resources, for long-range, comprehensive land use planning, for permits to regulate the use of public lands, and for the enforcement of public land laws and regulations. FLPMA compels agencies to manage all cultural resources on public lands through the land management planning process.

National Forest Management Act of 1976 (16 USC 1600) directs the Forest Service to develop renewable resource plans through an interdisciplinary process with public involvement and consultation with other interested governmental departments and agencies.

Archaeological Resources Protection Act of 1979 (ARPA) (16 USC 47Oaa et seq.), as amended, provides criminal penalties (felony and misdemeanor) and civil penalties for the unauthorized excavation, removal, damage, alteration, defacement, or the attempted unauthorized removal, damage, alteration, or defacement of any archaeological resource, more than 100 years of age, found on public lands or Indian lands. The act includes National Forest System lands in its definition of public lands. The act also prohibits the sale, purchase, exchange, transportation, receipt, or offering of any archaeological resource obtained from public lands or Indian lands in violation of any provision, rule, regulation, ordinance, or permit under the act, or under any federal, state, or local law. No distinction is made regarding NRHP eligibility. The act establishes permit requirements for removal or excavation of archaeological resources from federal and Indian lands. The act further directs federal land managers to survey land under their control for archaeological resources and create public awareness programs concerning archaeological resources. Uniform regulations and departmental regulations at 36 CFR Part 296 implement ARPA.

Native American Graves Protection and Repatriation Act of 1990 (NAGPRA) (25 USC. 3001) provides a process for museums and federal agencies to return certain Native American cultural items – human remains, funerary objects, sacred objects, or objects of cultural patrimony – to lineal descendants, culturally affiliated Indian tribes, and Native Hawaiian organizations. NAGPRA includes provisions for unclaimed and culturally unidentifiable Native American cultural items, intentional excavation and unanticipated discovery of Native American cultural items on federal and Tribal lands, and penalties for noncompliance and illegal trafficking. The act requires agencies and museums to identify holdings of such remains and objects and to work with appropriate Native American groups toward their repatriation. Permits for the excavation and removal of "cultural items" protected by the act require Tribal consultation, as do discoveries of "cultural items" made during activities on federal or Tribal lands. The Secretary of the Interior's implementing regulations are at 43 CFR Part 10.

Federal Lands Recreation Enhancement Act of December 8, 2004, (REA) (16 USC 6801-6814) permits federal land management agencies to charge modest fees at recreation facilities that provide a certain level of visitor services. The Act also permits fees for specialized recreation permits necessary when recreation activities require exceptional visitor safety measures, extraordinary natural and cultural resource protection, or dispersal of visitors to ensure that good experiences are sustainable. The Act includes provisions that require the use of Recreation Resource Advisory Committees to provide the public with information about fees and how fee revenues will be used. The primary goal of the Act is to enhance visitor facilities and services to provide a quality recreation program.

Executive Order 11593 also directs federal agencies to inventory cultural resources under their jurisdiction, nominate all federally owned properties that meet the criteria to the NRHP, use due caution until the inventory and nomination processes are completed, and assure that federal plans and programs contribute to preservation and enhancement of non-federally owned properties.

Executive Order 13007 - Indian Sacred Sites, issued May 24, 1996, directs federal land management agencies, to the extent permitted by law, and not clearly inconsistent with essential agency functions, to accommodate access to and use of Indian sacred sites, to avoid affecting the physical integrity of such sites wherever possible, and, where appropriate, to maintain the confidentiality of sacred sites. Federal agencies are required to establish a process to assure that affected Indian tribes are provided reasonable notice of proposed federal actions or policies that may affect Indian sacred sites.

Executive Order 13175 – Consultation and Coordination with Indian Tribal Governments, issued November 6, 2000, directs federal agencies to establish regular and meaningful consultation and collaboration with Tribal officials in the development of federal policies that have Tribal implications, to strengthen the United States government-to-government relationships with Indian tribes, and to reduce the imposition of unfunded mandates upon Indian tribes. Public Law (PL) 108-199 and 108-477 added language that directed the Office of Management and Budget and all federal agencies to consult with Alaska Natives and Alaska Native Corporations on the same basis as Indian tribes under EO 13175.

Executive Order 13287 – Preserve America, issued March 3, 2003, establishes federal policy to provide leadership in preserving America's heritage by actively advancing the protection, enhancement, and contemporary use of the historic properties owned by the federal government. The order encourages agencies to seek partnerships with State, Tribal, and local governments and the private sector to make more efficient and informed use of historic properties for economic development and other recognized public benefits. The order requires federal agencies to review and report on their policies and procedures for compliance with NHPA, Section 110 and 111, improve federal stewardship of historic properties, and promote long-term preservation and use of those properties as federal assets contributing to local community economies.

The order requires the head of each agency to designate a Senior Policy Official. In addition, it directs the Secretary of Commerce, working with other agencies, to use existing authorities and resources to assist in the development of local and regional heritage tourism programs.

Executive Order 13327 – Federal Real Property Asset Management, issued February 4, 2004, establishes the Federal Real Property Council to develop guidance for each agency's asset management plan. The Senior Real Property

Officer of each agency is required to develop and implement an agency asset management planning process that meets the form, content, and other requirements established by the Federal Real Property Council. In relation to cultural resources, the Senior Real Property Officer shall incorporate planning and management requirements for historic properties under EO 13287 – Preserve America. EO 13327, paragraph 2(a) defines "federal real property" as any real property owned, leased, or otherwise managed by the federal government, both within and outside the United States, and improvements on federal lands.

3.17.2 Cultural and Historic Overview of Bridgeport, Tonopah, Ely, and Austin Geothermal Decision Areas

Far Western Anthropological Research Group, Inc. (Far Western) has prepared a cultural overview of the planning area, documented in their Class I Cultural Resources Inventory for the Humboldt-Toiyabe National Forest Geothermal Leasing Project. This overview describes the prehistoric and historical resources of the planning area as described below, and is taken exclusively from their report (Far Western 2011).

A Class I cultural resources inventory is a professional study of existing data that includes a compilation, analysis and interpretation of all reasonably available archaeological, historical, and paleo-environmental data (Far Western 2011). The goal of the inventory is to identify all previously recorded cultural resources and their associated reports, resulting in a planning tool that illustrates the extent of previous investigations and the overall archaeological and cultural resource landscape in and adjacent to the proposed decision areas. The inventory covers four areas of the Humboldt-Toiyabe National Forest: the Bridgeport Geothermal Decision Area, an area of the Austin Ranger District near Grass Valley, an area of the Tonopah Ranger District in Big Smokey Valley, and an area of the Ely Ranger District in White River Valley; it includes all resources and inventory reports within the Bridgeport Geothermal Decision Area and within two miles of the Austin, Tonopah, and Ely Geothermal Decision Areas.

Class I Report Findings

A total of 1,824 heritage resources were identified from the Class I study area. Of these, 1,312 are prehistoric, 279 are historic era, 173 contain both prehistoric- and historic-period components, and four are of unknown age; 56 resources had no site records or other information available.

Table 3-9, Prehistoric Site Types by Area, summarizes the 1,483 prehistoric site components by type. As is typical of most Great Basin settings, the most common prehistoric site type is the Simple Flaked Stone assemblage. These are generally small, sparse scatters of lithic tools and debitage. However, the most notable feature of the prehistoric era resources is the relatively high

Table 3-9
Prehistoric Site Types by Area

Prehistoric Assemblage Type	Bridgeport	Austin	Tonopah	Ely	Total
Simple Flaked Stone	774	23	3	39	839
Complex Flaked Stone	165	2		7	174
Simple Ground Stone	95	2		8	105
Complex Ground Stone	80	1	3	2	86
Quarry	75				75
Quarry/Simple Ground Stone	4	1			5
Quarry/Complex Ground Stone	3	1			4
Game Drive Complex	8				8
Game Drive Complex/Complex Ground Stone	2				2
Feature Only	172			5	177
Ethnohistoric Place	2				2
Unknown Assemblage Type	5			1	6
Total	1385	30	6	62	1483
Counts of sites with:					
Rock rings/rock circles/house rings	249	1		7	257
Hearths	29			4	33
Rockshelters	18				18
Rock art	31				31
Corrals/game traps/drift fences	29				29
Blinds	31				31
Wickiups	13			1	14
Pinyon poles	8			2	10

Source: Far Western 2011

proportions of Complex Ground Stone and Complex Flaked Stone site types. These complex sites tend to be the types with the highest research potential, and hence the highest likelihood of being eligible for the NRHP. This trend is largely driven by the high density and complexity of prehistoric sites in certain parts of the decision area. Many of these complex sites contain rock rings, functioning either as habitation structures or pinyon caches. Also noteworthy are the number of recorded sites containing rock art, quarry sites (including elements of the Mount Hicks and Garfield obsidian source areas) and a unique site in the Anchorite Pass area, a game drive complex with associated rock walls, lithic scatters, and rock art (26MN5). Notable game drive complexes are also known and partially recorded on Table Mountain and elsewhere in the Bridgeport Ranger District. While these data certainly suggest some trends in prehistoric site density in different regions, it should be cautioned that these numbers are not a reliable proxy for overall site density because the decision areas have widely varying amounts of archaeological survey coverage.

Table 3-10, Historic-era Sites by Theme and Area, summarizes the historic-period resources. These are dominated by mining- and transportation-related resources, followed by unknown/non-thematic resources (typically debris scatters that cannot be associated with a theme). The Nevada General Land Office maps revealed 262 features, including named and unnamed roads, mining districts and associated claims and lodes, houses, ranches, and other structures. This information was gathered from General Land Office maps dating from 1869 to 1947 and representing a number of different styles and techniques of mapping (BLM 2011b). Many of the unnamed and named roads led to the Aurora Mining District.

Table 3-10
Historic-era Sites by Theme and Area

Historic Theme	Bridgeport	Austin	Tonopah	Ely	Total
Communication	9			1	10
Communication/Mining/People	1				1
Community Development	3				3
Government	3				3
Mining	156				156
Mining/Transportation	4				4
Mining/People	24				24
Mining/Logging	1				1
Mining/Community Development	4				4
Mining/Waterworks/CCC	2				2
Mining/Waterworks	1				1
People	7			1	8
Ranching	23	4			27
Recreation	1				1
Transportation/Ranching		1			1
Transportation	88	3			91
Waterworks	2				2
Unknown	115	2		5	122
Total	444	10	0	7	461

Source: Far Western 2011

The Class I review for the Ely Geothermal Decision Area did not identify any cultural resources, and no cultural inventories have ever been conducted in the Ely Geothermal Decision Area. A Class III pedestrian survey would be conducted in each decision area prior to ground-disturbing activities when a geothermal project is proposed as outlined in the Geothermal PEIS Appendix D, D-4 (BLM and Forest Service 2008).

3.18 TRIBAL INTERESTS AND TRADITIONAL CULTURAL RESOURCES

Tribal interests include economic rights such as Indian trust assets and resource uses and access guaranteed by treaty rights. Traditional cultural resources or properties include areas of cultural importance to contemporary communities, such as sacred sites or resource gathering areas. The following sections describe the ethnographic background of the regions for each decision area and Forest Service consultation with the planning area tribes.

3.18.1 Bridgeport Geothermal Decision Area

The majority of the Bridgeport Geothermal Decision Area lies within Northern Paiute territory according to Stewart (1941) and Fowler and Liljeblad (1986). The Washoe, whose core territory is to the north, utilized areas around Walker Lake, Topaz Lake, and Mono Lake (d'Azevedo 1986). Me-Wuks lived on the western slope of the Sierras, but frequently traveled into the area to trade with the Northern Paiute (Far Western 2011). In addition, hot springs are a tribal resource among some Numic tribes and bands in the Great Basin (i.e. Rock Springs TCP near Carlin, Nevada).

Northern Paiute

Four different Northern Paiute groups inhabited the general area: the Agai Ticutta (Trout Eaters) and Pugwi Ticutta (Fish Eaters) lived near Walker Lake, Tibusi Ticutta (Grass Bulb Eaters) lived along the Walker River, and Cozabee Ticutta (Fly Larvae Eaters) lived near Mono Lake (Johnson 1975). Northern Paiute groups within the Bridgeport Geothermal Decision Area exploited fisheries Mono Lake, Walker Lake, and Walker River provided. These watersheds provided fish, waterfowl, small game, seeds, and roots and served as centers for trading, feasting, and dancing. In the decision area, most Northern Paiute trade occurred with the Me-Wuk to the West in the Sierra. Northern Paiute trade goods included pine nuts, dried caterpillars, kutsavi, baskets, red and white paints, salt, obsidian, pumice, rabbit-skin blankets, and sinew-backed bows. Goods imported from the West included acorns, manzanita berries, shell beads, bear skins, arrows, baskets, and black and yellow paints. The relations with the Me-Wuk and other Paiute people were close and intermarriage was common.

The residents of Mono Lake, Walker Lake, and Walker River were semi-nomadic, subsisting on hunting, gathering, and fishing following a seasonal round. In the spring, roots and seeds were harvested by women while men hunted and fished. The trout runs in the spring were optimal times for large social gatherings. The summer was a time to collect and harvest berry and desert seeds, insect larvae, hunt deer, bighorn sheep, and trap mud hens. Fall foods consisted of pine nuts, deer, and rabbits. Rabbit drives, another time for social and festive gathering, also occurred in the fall because this is when the rabbits were the healthiest and most abundant. In ethnohistoric times, rabbit drives were held in Mason Valley and Smith Valley. Various foods were stored for the winter, primarily the pine nut; however, the crop was often unreliable (Hamilton

2009). In addition to numerous food resources, obsidian toolstone is also abundant in the study area. The named obsidian sources include Bodie Hills/Pine Grove Hills, Mount Hicks/Anchorite Hills and Garfield Hills, just east of the decision area.

Table Mountain, west of Aurora, bounded to the east by Bodie Creek and to the west by Rough Creek, was named Tunna' Nosi' Kaiva' Gwaa' or Antelope-Dreaming-Mountain-Place by the Paiute Indians (Shaw 2008). This sacred place was frequented and used as a habitation site on pine nut gathering trips. However with the influx of prospectors and others into the area, drawn to Aurora and the surrounding hillsides, pine nut gathering trips became less frequent or stopped abruptly, and traditional foraging was made obsolete as the livelihood of the native groups was eventually vanquished.

Washoe

Washoe territory is on the boundary between Great Basin and California culture areas, though Washoe cultural traits are more suggestive of ancestral roots in California than in the Great Basin (d'Azevedo 1986; Hamilton 2009). Washoe territory is bound on the west by the western slope of the Serra Nevada Mountains, the Pine Nut and Virginia Ranges on the east, Honey Lake on the north, and Sonora Pass on the south (Nevers 1976). They used geographic terms to refer to other subgroups: the welmelti, or 'northerners'; the pa wa lu, or 'valley dwellers'; and the hanalelti, or 'southerners.' The subgroup the Washoe people identified themselves with was generally based on their winter residence, which was often where they were born and spent most of their lives. However, shifting residences was a common practice within the Washoe community (Hamilton 2009).

Linguistic evidence suggests that the Washoe language may be the oldest in California, indicating great time depth in the historic Washoe area (Kroeber 1925; Sapir 1917). Washoe oral tradition regarding an ancient homeland on the western slope of the Sierra Nevada coincides with the suggestion that Washoe origins may lie as far back as the Martis complex of the Sierra Nevada, which spread into Washoe territory prior to 1,300 years ago (d'Azevedo 1986; Elston 1986). The Kings Beach Phase, which began after 1,300 years ago, likely represents an origin of the ethnohistoric Washoe culture and associated village sites (Clay et al. 1996). Relations between the Washoe and the neighboring Northern Paiute and Me-Wuk were generally peaceful and cooperative. Social organization based on a cluster of closely related households in the same or nearby winter camps with a common leader. Though intermarriage commonly occurred through intra-group relations, they developed external relations with the Pyramid Lake and Walker River Paiute, Me-Wuk, and sometimes the Maidu and Nisenan groups for trade, visiting, defense, and marriage (Hamilton 2009).

3.18.2 Austin Geothermal Decision Area

According to Steward (1938), the Western Shoshone occupied the Grass Valley vicinity. In contrast to the Reese River Valley where numerous villages and resources are located, Grass Valley was not a "home district" with no villages or resources noted (Steward 1938). However, archaeological work in the late 1960s into the 1970s has documented several ethnohistoric occupation sites with structural remains in the southern portion of Grass Valley (Clewlow and Rusco 1972; Clewlow et al. 1978). This evidence indicates Western Shoshone did indeed occupy this area and fundamentally had the same kind of culture as other nearby Western Shoshone (e.g., Reese River Valley) inhabitants reported by Steward and others (Thomas et al. 1986; Crum 1994).

For the Western Shoshone in this area, festivals occurred in the nearby Austin area with rabbit hunts taking place in Grass and Crescent valleys (Steward 1938). Pine nuts, an important food source for storage, could be acquired from the nearby mountain ranges, Roberts, Toiyabe and Cortez. Fish was also available from a tributary of Pine Creek as well as the Humboldt River (Steward 1938). Steward (1938) does note that people living along the Humboldt River sometimes wintered in the Grass Valley area. In essence, the Western Shoshone lifestyle was influenced by the location and availability of subsistence resources. Most plants were available within a short distance of the permanent encampments, allowing a relatively sedentary lifestyle with seasonal procurement trips of only a few days required to obtain valley or mountain resources. As noted above, Austin was a center of regional fall festivals and Beowawe to the north was another festival gathering locale for the people in the Grass Valley area.

3.18.3 Ely Geothermal Decision Area

The Western Shoshone occupying the Great Basin at the time of Euro-American contact were mobile hunters and gatherers who moved in a seasonal pattern. Steward (1938) notes families range 20 miles or more in each direction from their winter village. The Western Shoshone diet included a variety of plants with pinyon nuts a particularly important resource. The adjacent White Pine, Grant, and Quinn ranges provided pine nuts as well as other resources such as water and seeds. Steward (1938) does not indicate any villages located within White River Valley with no mention of neighboring groups visiting the valley for any communal animal drives. Further, on the village and subsistence map for Eastern Nevada, antelope is the only resource shown within the valley (Steward 1938). In nearby Railroad Valley to the west, communal antelope and rabbit drives were held in various locations within the valley (Branigan and Whiting 2007). The contemporary successors of the Western Shoshone continue to occupy the Great Basin in the vicinity of the Ely Geothermal Decision Area.

3.18.4 Tonopah Geothermal Decision Area

The Great Smoky Valley and the surrounding ranges were inhabited by the Newe or Western Shoshone. The valley was called Wiyumbahunovi (buffalo berry + water + valley) and inhabited by the Wiyumbitukanu (buffalo berry + eat + people) (Steward 1938).

Evidence from linguistic studies, archaeological sites, and genetic data reveal that Numic-speaking groups, like the Western Shoshone, expanded into the Great Basin around 1,000 years ago from a possible homeland near Bishop, California (Bettinger and Baumhoff 1982; Bettinger 1994; Lamb 1958). These data conflict with Shoshone and Paiute assertion that they are the original occupants of the present territory.

Western Shoshone subsistence and settlement patterns were structured around the availability of plant foods. However, communal animal drives were important seasonal social and procurement gatherings. Collective antelope drives occurred in the early spring, the place was chosen usually at the suggestion of an antelope shaman, though this was a rare occasion because it took so long for the antelope population to recover (Steward 1938). Summer villages were likely in the uplands of the Toquima Range, and Toiyabe Range (Thomas 1982). Seeds and berries were gathered in warmer months and supplied provisions for winter along with the pine nut collected in the fall. The Ione Reese River and Smith Creek Valley bands, as did many central Nevada groups, manipulated their environments to increase seed production and claimed ownership over certain seed-bearing patches (Steward 1938). However, Steward (1938) posits that the Big Smoky Valley Shoshone differed from other Nevada Shoshone groups in that they did not claim ownership over seed areas, thus the groups in the valley gathered seeds freely. Shoshone groups of east central Nevada often sowed or broadcast Mentzelia and Chenopodium seeds and irrigation of seed crops may have occurred. Among other seeds, ricegrass or sand bunch grass was vitally important and second only to pine nut. In the spring, summer, and fall months, small kin groups traveled together and during pinyon harvests and rabbit hunts came together for rituals and celebrations such as the Round Dance (Stoner et al. 2010; Steward 1938). Social gatherings like the Great Smoky Valley five-day fall festival and dance held at Millett Ranch, Darroughs, or Manhattan followed by a ten-day rabbit hunt drew in many groups from nearby valleys (Mordy and McCaughey 1968; Steward 1938). Ethnohistoric winter villages were on the fringes of the valley near water sources at Millett Ranch, Peavine Creek, and at Darrough's Hot Springs (Steward 1938).

3.18.5 Tribal Consultation

The Humboldt-Toiyabe National Forest District Rangers have consulted with federally recognized tribes in the planning area, including the Ely Shoshone Tribe, Duckwater Shoshone Tribal Council, Yomba Shoshone Tribe, Te-Moak Tribe of Western Shoshone, Battle Mountain Band Council, Fallon Paiute Shoshone Tribe, Winnemucca Indian Colony, Elko Band Council, Yerington

Paiute Tribe, Bridgeport Indian Colony, Bishop Paiute, Walker River Paiute, Washoe Tribe of Nevada and California, Mono Lake Tribe, Goshute Tribe, and Benton Paiute Tribe.

The Forest Service sent letters to the above tribes describing the project and requesting consultation with an invitation to participate in any requested council meetings and/or field trips to the decision areas. Four tribes responded with requests for the Forest Service to present the project information at council meetings and on field trips. The Forest Service presented at the Goshute Tribal Council meeting, the Ely Shoshone Tribal Council meeting, and the Duckwater Tribal Council meeting. The Forest Service also conducted field trips to the decision areas with the Ely Shoshone and Duckwater Shoshone tribal representatives. In addition, eight tribes were provided the Class I Cultural Report. Two tribes expressed concerns related to traditional property uses and the desire to not change anything. Tribes also wished to be kept informed of developments. The Forest Service has committed to ongoing Tribal consultation with affected tribes, and will continue to do so throughout the project.

3.19 NATIONAL SCENIC AND HISTORIC TRAILS

3.19.1 Background

The National Trails System Act of 1968 (16 USC 1241-51) established the framework for the National Trails System. The purpose of this Act is to accommodate the outdoor recreation needs of an increasing population while preserving the environment, history, and natural aesthetics of open areas (BLM 2006b). National Scenic Trails and National Historic Trails are congressional designations given to protected areas in the US that contain trails and surrounding areas of particular natural beauty and historic significance. National trails are officially established under the authorities of the National Trails System Act (16 USC 1241-51). The National Trails System is made up of National Scenic Trails, National Historic Trails, and National Recreation Trails.

National Scenic Trails are 100 miles or longer, continuous, primarily nonmotorized routes of outstanding recreation opportunity. National Historic Trails commemorate historic and prehistoric routes of travel that are of significance to the entire nation. National Historic Trails have as their purpose the identification and protection of the historic route and its historic remnants and artifacts for public use and enjoyment (NPS 2006). They must meet three criteria listed in Section 5(b)(11) of the National Trails System Act:

- They must follow actual documented route of historic use;
- They must be of national significance; and
- They must possess significant potential for public recreation and/or interpretation.

National Scenic Trails and National Historic Trails may only be authorized by Congress. National Recreation Trails, also authorized in the National Trails System Act, are existing regional and local trails recognized by either the Secretary of Agriculture or the Secretary of the Interior upon application.

Administration of each trail is officially assigned to or shared among the US Department of Interior, National Park Service, BLM, and the Forest Service. Subject to available funding, the administering agencies exercise trail-wide responsibilities under the Act for that specific trail. Such responsibilities include coordination among and between agencies and partner organizations in planning, marking, certifying, preserving and protecting resources, interpreting, establishing cooperative / interagency agreements, and offering financial assistance to other cooperating government agencies, landowners, interest groups, and individuals.

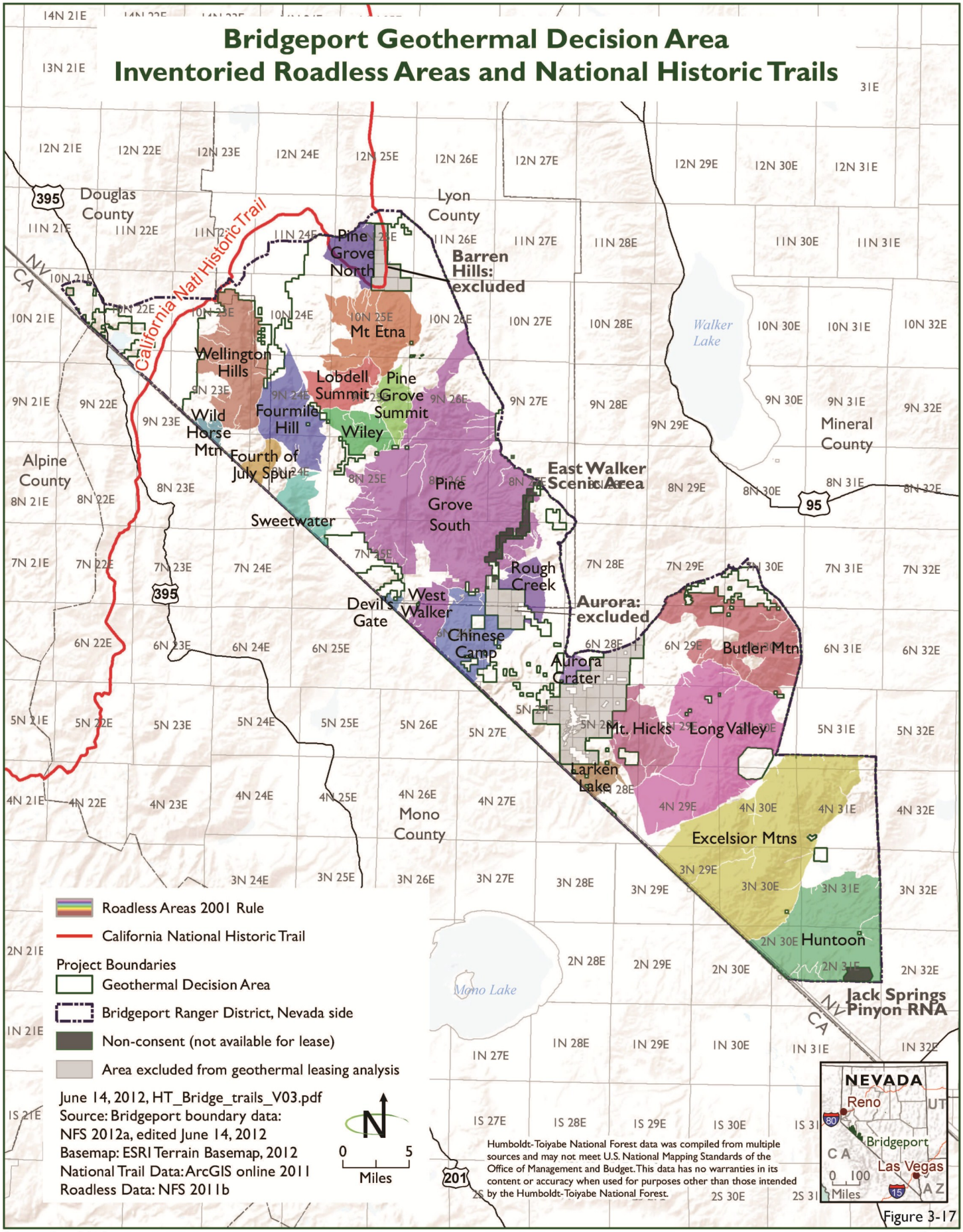
National trails cross numerous jurisdictions, with various segments managed by a variety of landowners or agencies. On-site management responsibilities often include managing inventory of resources; mapping, planning, and developing trail segments or sites; ensuring compliance; making provisions of appropriate public access; offering site interpretation; maintaining trails; marking trails; preserving or protecting resources; protecting viewsheds; and managing visitor use.

There are approximately 5 miles of National Historic Trails traversing the planning area, occurring entirely in the northern part of the Bridgeport Geothermal Decision Area. **Figure 3-17**, Bridgeport Geothermal Decision Area Inventoried Roadless Areas and National Trails, shows the location of the trail crossing in the planning area, as well as inventoried roadless areas. **Figure 3-18**, Austin, Ely, Tonopah Geothermal Decision Areas Roadless Areas and National Trails, shows the same information for those districts.

3.19.2 National Historic Trails

California Trail

The trail was used by over 250,000 farmers and gold seekers during the 1840s and 1850s. The route starts along the Missouri River and then converges on the Great Platte River Road, overlaps with the Oregon Trail, and continues through the Rocky Mountains. After crossing the Rockies, many routes were used to get to and cross the Sierra Nevada. The total system of trails that make up the California Trail is approximately 5,664 miles (NPS 2007a). The California Trail crosses approximately 5 miles of National Forest System land within the Bridgeport Geothermal Decision Area.


Bridgeport Geothermal Decision Area
Inventoried Roadless Areas and National Historic Trails
Douglas County
Lyon County
Mineral County
Alpine County
Mono County
California Natl Historic Trail
NV
CA
395
95
Pine Grove North
Barren Hills: excluded
Mt Etna
Wellington Hills
Lobdell Summit
Pine Grove Summit
Fourmile Hill
Wiley
Wild Horse Mtn
Fourth of July Spur
Sweetwater
Pine Grove South
East Walker Scenic Area
Rough Creek
West Walker
Devil's Gate
Chinese Camp
Aurora: excluded
Aurora Crater
Butler Mtn
Mt. Hicks
Long Valley
Larken Lake
Excelsior Mtns
Huntoon
Jack Springs Pinyon RNA
Walker Lake
Mono Lake
Roadless Areas 2001 Rule
California National Historic Trail
Project Boundaries
Geothermal Decision Area
Bridgeport Ranger District, Nevada side
Non-consent (not available for lease)
Area excluded from geothermal leasing analysis
June 14, 2012, HT_Bridge_trails_V03.pdf
Source: Bridgeport boundary data: NFS 2012a, edited June 14, 2012
Basemap: ESRI Terrain Basemap, 2012
National Trail Data: ArcGIS online 2011
Roadless Data: NFS 2011b
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Miles
Humboldt-Toiyabe National Forest data was compiled from multiple sources and may not meet U.S. National Mapping Standards of the Office of Management and Budget. This data has no warranties in its content or accuracy when used for purposes other than those intended by the Humboldt-Toiyabe National Forest.
NEVADA
Reno
Bridgeport
CA
Las Vegas
AZ
UT
0 100
Miles

Figure 3-17

Austin, Ely, Tonopah Geothermal Decision Areas
Roadless Areas and National Trails

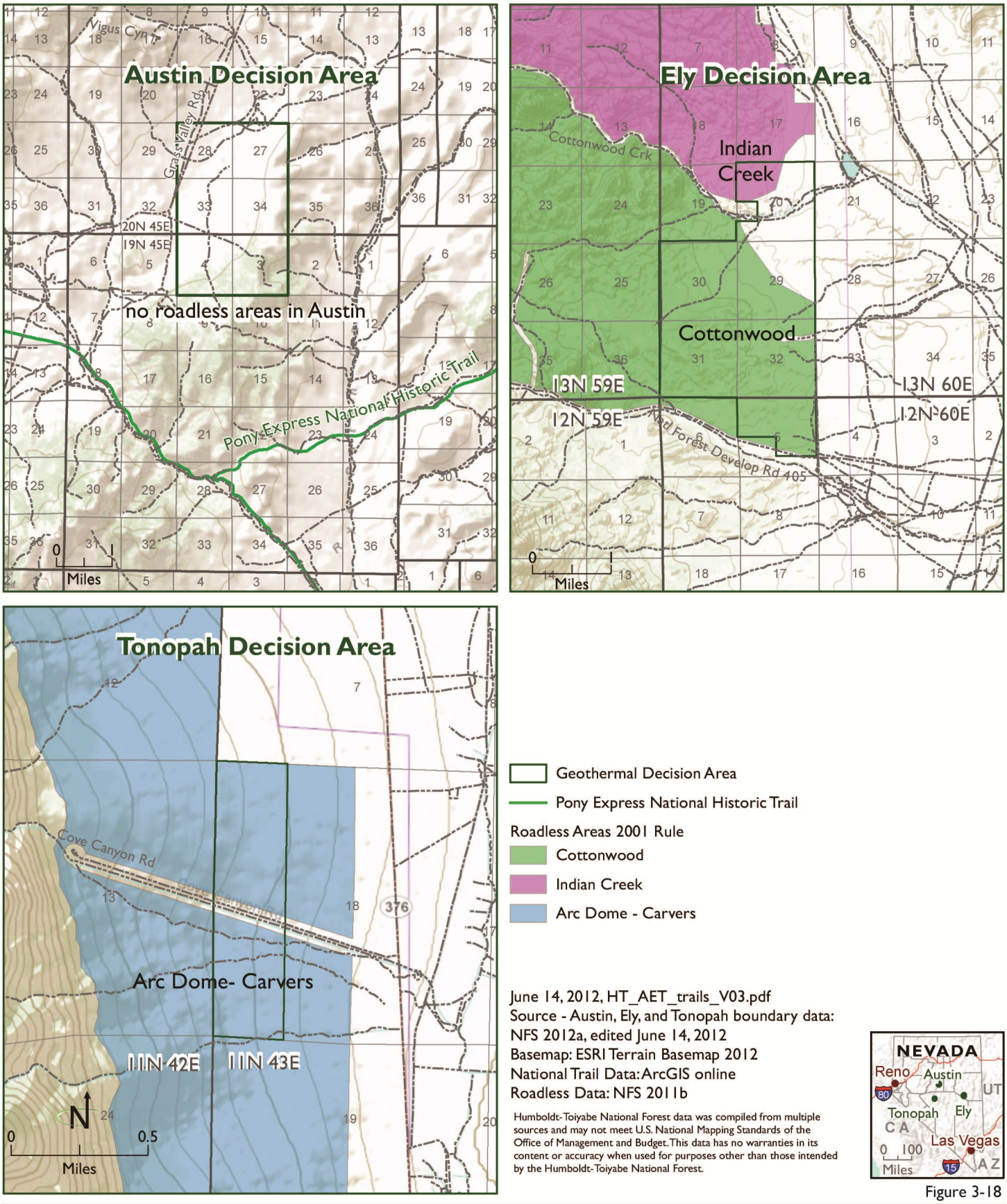


Figure 3-18

Pony Express National Historic Trail

This began in 1860 as a mail route connecting the eastern US with California. It was privately financed and was used only for 18 months before the telegraph system was constructed and replaced the Pony Express. Riders on horseback transported mail from Missouri to California in ten days, traveling over 1,800 miles. The transcontinental railroad later followed much of this route (NPS 2007b). The Pony Express National Historic Trail does not traverse the Austin Geothermal Decision Area but is located approximately two miles south of the Austin Geothermal Decision Area.

3.19.3 National Scenic Trails

There are no designated National Scenic Trails in the planning area; therefore, these are not discussed further in this document.

3.20 VISUAL RESOURCES

This section describes the visual resources in the ROI for the planning area. The ROI is the land area within and adjacent to potential lease areas. Described below is the method for managing scenic resources and the visual landscape of the pending lease areas.

3.20.1 Visual Management System

The scenery of the National Forest System lands is managed through the application of the Visual Management System (Agricultural Handbook- 462, National Forest Landscape Management, Volume 2, Chapter 1, The Visual Management System). The Visual Management System was adopted by the Forest Service in 1974. The key component of the Visual Management System is the establishment of Visual Quality Objectives (VQOs) within the LRMPs.

There are five differing levels of VQOs: Preservation, Retention, Partial Retention, Modification, and Maximum Modification. The following is a brief description of the five VQOs:

- Preservation – Allows ecological change only. Management activities are prohibited except for very low visually impacting recreation facilities.
- Retention – Management activities may not be visually evident. Contrasts in form, line, color, and texture must be reduced during or immediately following the management activity.
- Partial Retention – Management activities must remain visually subordinate to the characteristic landscape. Associated visual impacts in form, line, color, and texture must be reduced as soon after project completion as possible or at a minimum within the first year.
- Modification – Management activities may visually dominate the characteristic landscape. However, landform and vegetation

alterations must borrow from naturally established form, line, color, or texture so as to blend in with the surrounding landscape character. The objective should be met within one year of project completion.

- Maximum Modification – Management activities including vegetation and landform alterations may dominate the characteristic landscape. However, when viewed as background they must visually appear as natural occurrences within the surrounding landscapes or character type. When viewed as foreground or middle ground, they may not appear to completely borrow from naturally established form, line, color, or texture. Alterations may also be out of scale or contain detail which is incongruent with natural occurrences as seen in foreground or middle ground. Reduction of contrast should be accomplished within five years.

An inventory of the visual resources within the planning area was completed for the Humboldt and Toiyabe LRMPs using the Visual Management System. Any lands that have been added to the National Forest System within the planning area after the LRMPs were prepared have not been inventoried for VQO. This includes the southern portion of the Bridgeport Geothermal Decision Area. Future phases of geothermal leasing or development would require a site-specific analysis that considers VQO for that area.

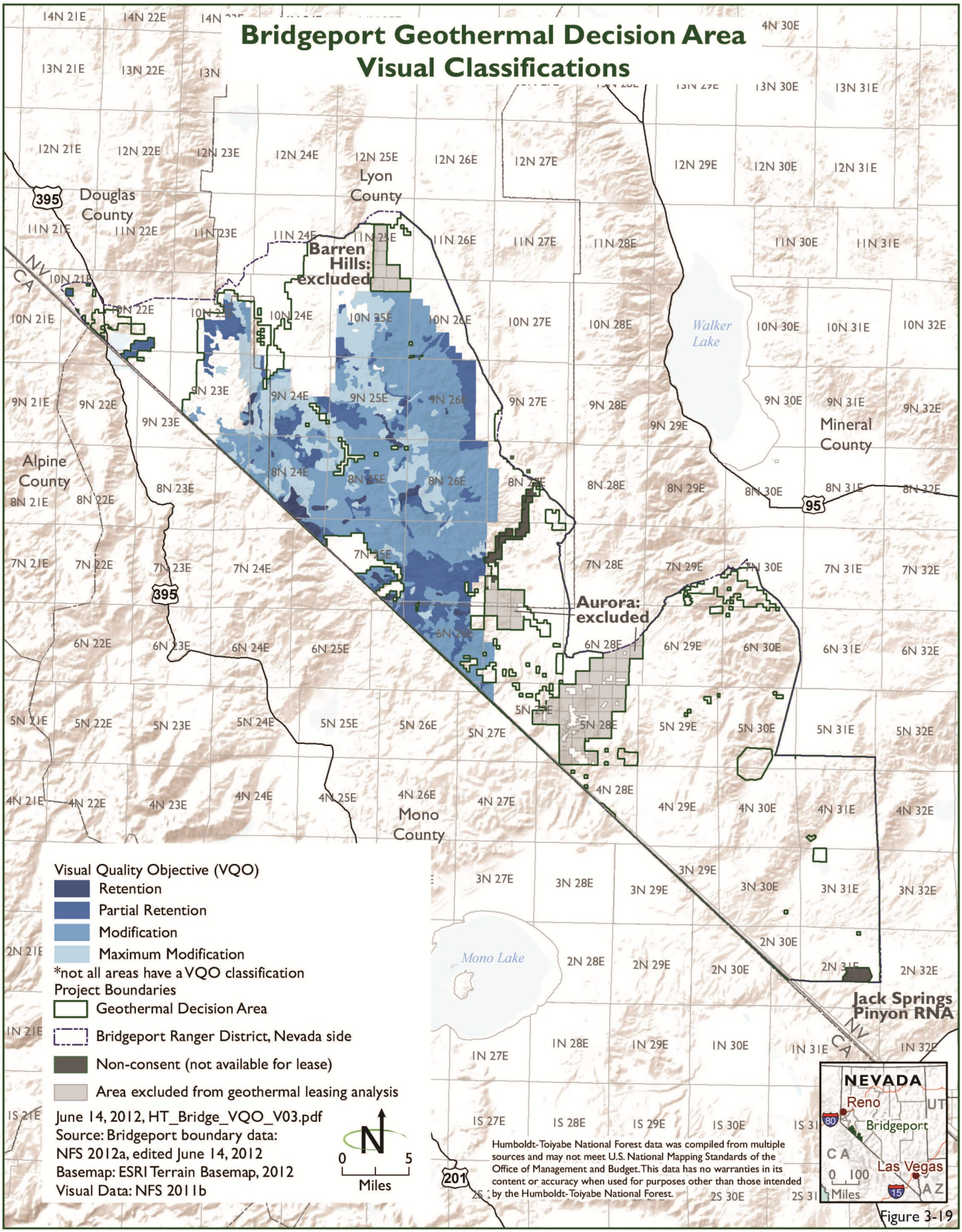
The visual characteristics of the planning area are typical of the area of Nevada known as the Great Basin (see **Figures 3-19**, Bridgeport Geothermal Decision Area Visual Classifications, and **3-20**, Austin, Ely, Tonopah Geothermal Decision Areas Visual Classifications). This area is expansive, often barren, but frequently colorful. The form, line, color, and texture of the Great Basin landscape are influenced by the arid climate. Mountain ranges parallel sun-saturated, brush-strewn valley floors interspersed with barren, bleached alkali playas. Higher elevations support sagebrush, juniper, pinyon pine, and conifer. This vegetation provides visual diversity and contrasting darker color along ridgelines in the distant background. Vegetation on the valley floor grows low and evenly and primarily consists of monochromatic desert brush. Although the areas are sparsely populated, fences, utility lines, roads (paved and dirt), historic trails, trailer houses, mines, and road signs are present (BLM 2006a).

3.20.2 Bridgeport Geothermal Decision Area

Of the land in the Bridgeport Geothermal Decision Area that has been inventoried for VQO, the majority has been identified as modification. There are also areas identified as retention, partial retention, modification, and maximum modification.

3.20.3 Austin Geothermal Decision Area

The Austin Geothermal Decision Area is identified as modification under the VQOs.


Bridgeport Geothermal Decision Area
Visual Classifications
Douglas County
Lyon County
Barren Hills: excluded
Alpine County
Mineral County
Aurora: excluded
Mono County
Walker Lake
Mono Lake
Jack Springs Pinyon RNA
NV
CA
395
95
201
Visual Quality Objective (VQO)
Retention
Partial Retention
Modification
Maximum Modification
*not all areas have a VQO classification
Project Boundaries
Geothermal Decision Area
Bridgeport Ranger District, Nevada side
Non-consent (not available for lease)
Area excluded from geothermal leasing analysis
June 14, 2012, HT_Bridge_VQO_V03.pdf
Source: Bridgeport boundary data:
NFS 2012a, edited June 14, 2012
Basemap: ESRI Terrain Basemap, 2012
Visual Data: NFS 2011b
N
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Miles
Humboldt-Toiyabe National Forest data was compiled from multiple sources and may not meet U.S. National Mapping Standards of the Office of Management and Budget. This data has no warranties in its content or accuracy when used for purposes other than those intended by the Humboldt-Toiyabe National Forest.
NEVADA
Reno
Bridgeport
CA
Las Vegas
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Miles
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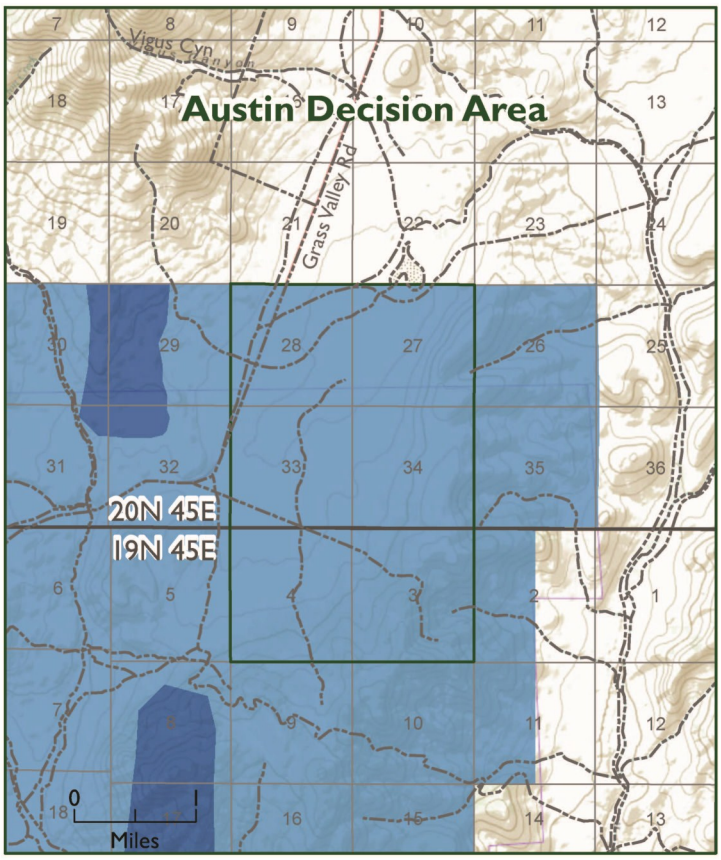
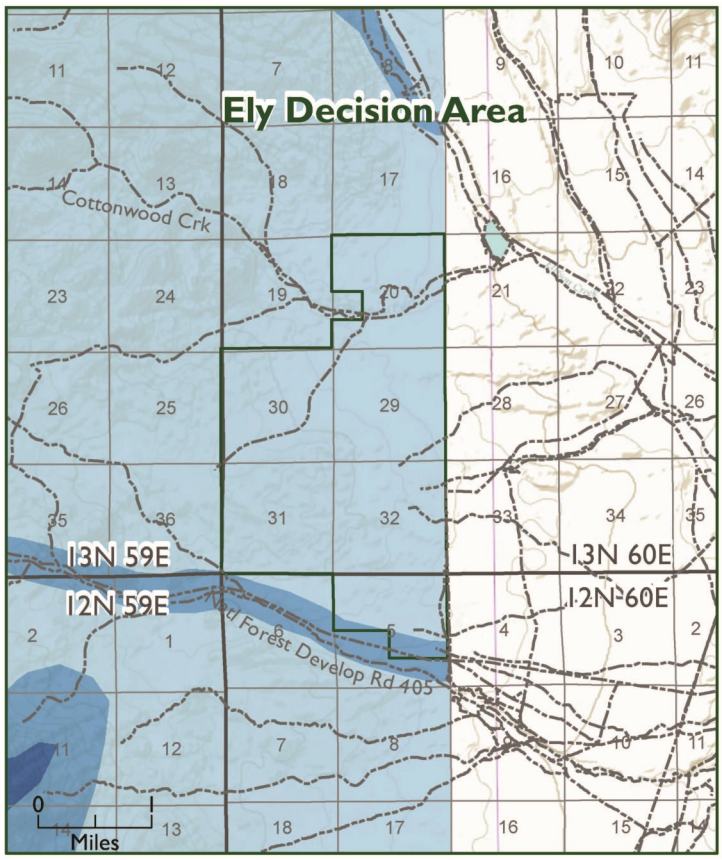
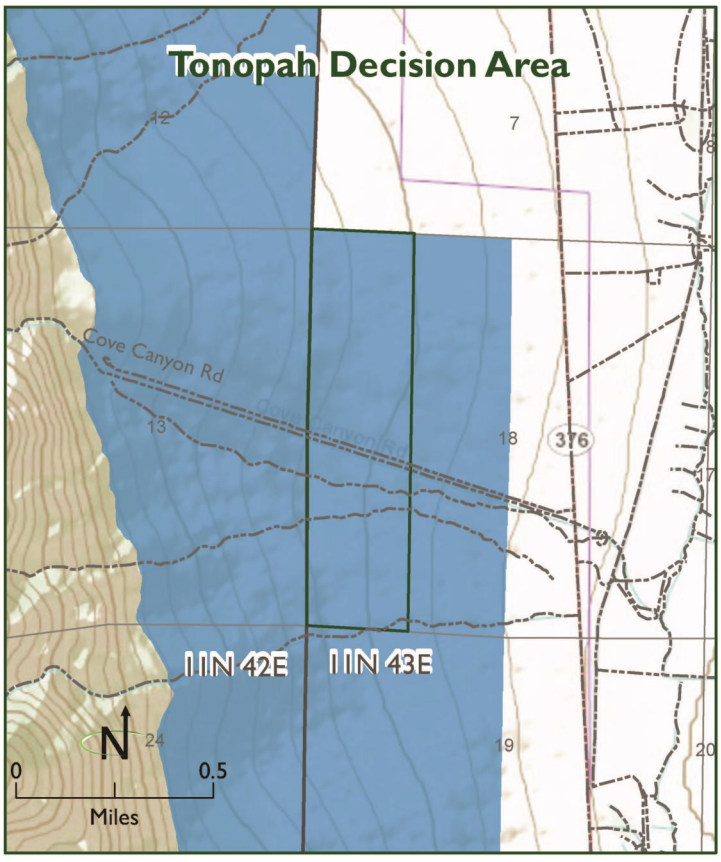
AZ

Figure 3-19

Austin, Ely, Tonopah Geothermal Decision Areas
Visual Classifications







Geothermal Analysis Area

Visual Quality Objective

- Partial retention
- Modification
- Maximum Modification

June 14, 2012, HT_AET_VQO_V03.pdf
Source: Austin, Ely, and Tonopah boundary data: NFS 2012a, edited June 14, 2012
Basemap: ESRI Terrain Basemap 2012
Visual Data: NFS 2011b

Humboldt-Toiyabe National Forest data was compiled from multiple sources and may not meet U.S. National Mapping Standards of the Office of Management and Budget. This data has no warranties in its content or accuracy when used for purposes other than those intended by the Humboldt-Toiyabe National Forest.

Figure 3-20

3.20.4 Ely Geothermal Decision Area

The VQO designation for the Ely Geothermal Decision Area is mostly maximum modification with a small portion along Forest Service Road 405 identified as modification.

3.20.5 Tonopah Geothermal Decision Area

The VQO designation for the Tonopah Geothermal Decision Area is modification.

3.21 HEALTH AND SAFETY

The 2008 Geothermal PEIS describes health and safety concerns associated with geothermal energy development as well as the regulatory framework around the health and safety of workers involved in such development. In the future, when NEPA is conducted for specific geothermal exploration and development project proposals within four decision areas, site-specific health and safety risks would be documented. Existing health and safety risks within the planning area relate to existing and abandoned mines, ongoing mining and exploration, timber harvest operations, recreational activities, hunting, and transportation.

3.22 NOISE

The 2008 Geothermal PEIS provides environmental noise fundamentals, background noise levels, noise propagation, and noise standards and guidelines related to geothermal resource development.

The federal law that directly affects noise control is the Noise Control Act of 1972, as amended by the Quiet Communities Act of 1978 (42 USC 4901-4918). This Act delegates to the states the authority to regulate environmental noise. It also directs government agencies to comply with local community noise statutes and regulations and to conduct their programs to promote an environment free of any noise that could jeopardize public health or welfare. Nevada has adopted by reference the federal Occupational Safety and Health Administration regulations on noise (29 CFR 1910.95), which address worker exposure. No additional state requirements apply.

Geothermal developers on National Forest System lands are subject to BLM leasing regulations. BLM regulations mandate that noise at one-half mile – or at the lease boundary, if closer – from a major geothermal operation shall not exceed 65 A-weighted decibels (43 CFR 3200.4[b]).

Background noise is the noise from all sources other than the source of interest (e.g., geothermal operations). The background noise level can vary considerably depending on the location. There is currently no available information defining existing noise levels across the planning area. In the future, when NEPA is conducted for specific geothermal exploration and development project proposals within the four decision areas, any available background noise for a proposed project site would be discussed. Natural background noises expected

to exist in such areas include agricultural activities, recreation activities (including mechanized and motorized uses), and aircraft overflights.

Lands within the planning area currently experience noise from vehicle traffic, aircraft over flights, agricultural production, household noise (lawn maintenance, vehicle repair, house repair, etc.), and general day to day activities of the population.

3.23 HAZARDOUS MATERIALS

The 2008 Geothermal PEIS describes hazardous substances associated with geothermal energy development as well as the regulatory framework for dealing with pre-existing contamination at project sites. Hazardous materials within planning area soils and groundwater may include, but are not limited to, accident-related spills along highways and railways, mine tailings and other mining byproducts near mines, petroleum products and mining related chemicals, lead from hunting and target practice, and dump sites.

3.24 CLIMATE CHANGE

3.24.1 Climate

Weather data for the planning area were obtained from the Western Regional Climate Center. In the area including the Bridgeport Geothermal Decision Area, data show average maximum temperatures of 48 degrees Fahrenheit (°F) in January and 96°F in July and average minimum temperatures of 24°F in January and 61°F in July. The climate is dry, with an annual average total precipitation of 4.54 inches and an average annual snowfall of 2.8 inches (WRCC 2011a).

In the area including the Ely Geothermal Decision Area, data show average maximum temperatures of 39°F in January and 87°F in July and average minimum temperatures of 10°F in January and 48°F in July. The climate is less arid than around the Bridgeport Ranger District, with an annual average total precipitation of 9.68 inches and an average annual snowfall of 53.5 inches (WRCC 2011b).

In the area including the Austin Geothermal Decision Area, data show average maximum temperatures of 40°F in January and 86°F in July and average minimum temperatures of 19°F in January and 54°F in July. The average annual rain and snowfall amounts are higher than Ely, with an annual average total precipitation of 12.37 inches and an average annual snowfall of 57.6 inches (WRCC 2011c).

In the area including the Tonopah Geothermal Decision Area, data show average maximum temperatures of 44°F in January and 91°F in July and average minimum temperatures of 19°F in January and 57°F in July. Similar to the Bridgeport Geothermal Decision Area, Tonopah has an annual average total precipitation of 5 inches. The average annual snowfall amount is 13 inches (WRCC 2011d).

3.24.2 Climate Change

Greenhouse gases are gases that allow short-wave solar radiation to enter the Earth's atmosphere but absorb long-wave infrared radiation re-emitted from the Earth's surface. Over time the amount of energy sent from the sun to the Earth's surface should be approximately the same as the amount of energy radiated back into space, leaving the temperature of the Earth's surface roughly constant. Most studies, however, indicate that the Earth's climate has warmed over the past century and that human activities producing greenhouse gases are likely an important contributing factor. Climate models predict that if greenhouse gases continue to increase, the average temperature at the Earth's surface could increase from 3.2 to 7.2°F (1.8 to 4.0°C) above 1990 levels by the end of this century (EPA 2011).

Sources of Greenhouses Gas Emissions

Gases exhibiting greenhouse properties come from both natural and human sources. Water vapor, carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O) are examples of greenhouse gases that have both natural and manmade sources, while other greenhouse gases, such as chlorofluorocarbons, are exclusively manmade.

In the US, greenhouse gas emissions come mostly from energy use. Such emissions result from combustion of fossil fuels used for electricity generation, transportation, industry, heating, and other needs. Energy-related CO_2 emissions represent over 80 percent of total manmade greenhouse gas emissions in the US (EIA 2009). More than half the energy-related emissions come from large stationary sources such as power plants, while about a third comes from transportation. Industrial processes (such as the production of cement, steel, and aluminum), agriculture, forestry, other land use, and waste management are also important sources of greenhouse gas emissions in the United States (EPA 2011).

In Nevada, electrical generation, transportation, and the combined residential, commercial and industrial sectors comprise over 90 percent of total greenhouse gas emissions generated in the state. Electrical generation, at over 45 percent, accounted for half of this total amount (NDEP 2008).

Effects of Climate Change

Climate change effects include sea level rise, shrinking glaciers, changes in the range and distribution of plants and animals, plants blooming earlier, lengthening of growing seasons, ice on rivers and lakes freezing later and breaking up earlier, and thawing of permafrost. In the US, scientists believe that most areas will continue to warm, although some will likely warm more than others. It is difficult to predict which parts of the country will become wetter or drier, but scientists generally expect increased precipitation and evaporation, and drier soil in the middle parts of the country (EPA 2011). Temperature increases in the West over the next century are expected to range from 2 to 3°C at the low

end of the uncertainty range to 5 to 6°C at the upper end of the uncertainty range. Beyond mid-century, future warming is dependent on greenhouse gas emission levels in the next few decades, which are dependent on human activities (Forest Service 2011b).

In the western US, increased temperatures have led to more precipitation falling as rain rather than snow, earlier snowmelt and snowmelt-driven streamflow, and reduced spring snowpack. Increased temperatures may also result in decreased soil moisture in arid regions of the western US. Warmer temperatures and higher rates of evapotranspiration with climate change in some areas, such as the southwest US, will likely lead to increased drought frequency and severity. Overall, drought-affected areas are projected to increase in extent. Although increased temperatures will likely lead to decreased runoff in some areas, increased frequency of heavy precipitation events will likely lead to increased flood risk in many regions. Earlier snowmelt and runoff owing to increased temperatures could also lead to increased winter and spring flooding (Forest Service 2011b).

Increasing temperatures and changes in precipitation with climate change impact ecosystem structure, such as vegetation and wildlife abundance and distribution, and ecosystem processes, such as fire.

Regulatory Considerations

The Final Mandatory Reporting of Greenhouse Gases Rule issued by the EPA on September 22, 2009, requires suppliers of fossil fuels or industrial greenhouse gases, manufacturers of vehicles and engines, and facilities that emit 25,000 metric tons or more per year of greenhouse gas emissions to submit annual reports to the EPA. In 2007, the Nevada Legislature passed a requirement that electrical generating power plants in the state with a maximum design output of 5 MW or greater must report their greenhouse gas emissions; however, units that use renewable energy sources are specifically exempted from the reporting requirement (Nevada Revised Statute 445B.370[4][a]).

3.25 SOCIOECONOMIC VALUES

The construction and operation of geothermal power plants contributes to local, state, and national economies through the creation of jobs, generation of property taxes, payments of revenues, and voluntary contributions to communities. The use of National Forest System lands in the planning area for geothermal energy development affects the demographic characteristics and economies of the planning area. Additionally, social structure and values within the planning area shape the demand and opportunities created by National Forest System lands.

For these reasons, demographic, economic, and social data for the planning areas in each of the four decision areas are presented in this section. Counties where the four decision areas are located were selected as the ROI for socioeconomic and environmental justice analysis as the impacts of leasing are

likely to occur within this region. A summary of the population, housing, and low-income and minority populations for the County is provided based primarily on data from Census 2000 and 2010 population, demographic and housing information (US Census Bureau 2000, 2010), and employment information from Nevada Workforce Local Area Profile (Nevada Workforce 2011).

3.25.1 Bridgeport Ranger District

The Bridgeport Ranger District planning area covers approximately 607,560 acres within Lyon, Douglas, and Mineral Counties. These Counties were selected as the ROI for socioeconomic analysis as the impacts of leasing are likely to occur within this region.

Population

Table 3-11, Bridgeport Geothermal Decision Area – Population by County, provides population data for 2000 and 2010 for Lyon, Douglas, and Mineral County. Overall, the total population in this decision area has grown between 2000 and 2010. However, there was a decrease in population in Mineral County during this period.

Table 3-11
Bridgeport Geothermal Decision Area – Population by County

	2000	2010	Percent change
Lyon	34,501	51,980	+ 50.7%
Douglas	41,262	46,997	+ 13.9%
Mineral	5,071	4,772	- 5.9%

Source: US Census Bureau 2000, 2010

Housing

Table 3-12, Bridgeport Geothermal Decision Area – Housing Units by County, provides housing data for 2000 and 2010 for Lyon, Douglas, and Mineral County. Overall, the total housing supply in this decision area has grown between 2000 and 2010. The percent of vacant houses in Douglas and Mineral County increased between 2000 and 2010; Lyon County vacancy rate decreased.

Table 3-12
Bridgeport Geothermal Decision Area – Housing Units by County

	2000	2009	Percent change	2000 Vacancy	2010 Vacancy
Lyon	17,498	18,243	+ 21.7%	8.9%	4.7%
Douglas	19,006	23,410	+ 18.8%	13.7%	17.3%
Mineral	2,866	2,870	+ 0.3%	23.3%	24.3%

Source: US Census Bureau 2000, 2010; Sperlings 2011

Employment

Lyon County
In May 2011, the work force consisted of 22,058 people, of which 18,565 people were employed, and 3,493 people, or 15.8 percent of the population, were unemployed. This is an increase in unemployment from May 2000, when the workforce consisted of 17,598, of which 16,631 were employed and 967, or 5.5 percent, were unemployed (Nevada Workforce 2011).

Douglas County
In May 2011, the work force consisted of 21,043 people, of which 18,234 people were employed and 2,809 people, or 13.3 percent of the population, were unemployed. This is an increase in unemployment from May 2000, when the workforce consisted of 21,546, with 20,678 employed and 868, or 4.0 percent, unemployed (Nevada Workforce 2011).

Mineral County
In May 2011, the work force consisted of 2,251 people, of which 1,956 people were employed, and 295 people, or 13.1 percent of the population, were unemployed. This is an increase in unemployment from May 2000, when the workforce consisted of 2,354, with 2,178 employed and 176, or 7.5 percent, unemployed (Nevada Workforce 2011).

Demographics

Lyon County
Based on 2010 data, 78.2 percent of the population in the county was White of non-Hispanic descent. The largest minority group in the area is Hispanic or Latino, comprising 14.8 percent of the population. American Indians comprise approximately 2.5 percent of the population. In 2009, 10.2 percent of individuals were below the poverty level, compared with the state average of 12.4 percent (US Census Bureau 2010).

Douglas County
Based on 2010 data, 83.2 percent of the population in the county was White of non-Hispanic descent. The largest minority group in the area is Hispanic or Latino, comprising 10.9 percent of the population. American Indians comprise approximately 1.9 percent of the population. In 2009, 9.4 percent of individuals were below the poverty level, compared with the state average of 12.4 percent (US Census Bureau 2010).

Mineral County
Based on 2010 data, 68.5 percent of the population in the county was White of non-Hispanic descent. The largest minority group in the area is American Indians, comprising 15.5 percent of the population. Hispanic or Latino comprises approximately 9.1 percent of the population. In 2009, 18.3 percent of individuals

were below the poverty level, compared with the state average of 12.4 percent (US Census Bureau 2010).

3.25.2 Austin Geothermal Decision Area

The Austin Geothermal Decision Area covers approximately 3,961 acres within Lander County. Lander County was selected as the ROI for socioeconomic analysis as the impacts of leasing are likely to occur within this region.

Population

Total population within the county was 5,775 in 2010 (US Census Bureau 2010), a 0.3 percent decrease in population over 2000 when the population was 5,794 (US Census Bureau 2000).

Housing

In 2009, the total number of housing units was 2,787 (US Census Bureau 2011). The vacancy rate was 27.7 percent in June 2010 (Sperlings 2011). In 2000, there were 2,780 total housing units with 2,093 occupied for a vacancy rate of 24.7 percent (US Census Bureau 2000).

Employment

In May 2011, the work force consisted of 4,179 people, of which 3,939 people were employed and 240 people, or 5.7 percent of the population, were unemployed. This is an increase in unemployment from May 2000, when the workforce consisted of 2,867, with 2,715 employed and 152, or 5.3 percent, unemployed (Nevada Workforce 2011).

Demographics

Based on 2010 data, 73.7 percent of the population in the county was White of non-Hispanic descent. The largest minority group in the area is Hispanic or Latino, comprising 21.1 percent of the population. American Indians comprise approximately 4.2 percent of the population. In 2009, 18.3 percent of individuals were below the poverty level, compared with the state average of 12.4 percent (US Census Bureau 2010).

3.25.3 Ely Ranger District

The Ely Geothermal Decision Area covers approximately 3,538 acres within White Pine County. White Pine County was selected as the ROI for socioeconomic analysis as the impacts of leasing are likely to occur within this region.

Population

Total population within the county was 10,030 in 2010 (US Census Bureau 2010), a 9 percent increase in population over 2000, when the population was 9,181 (US Census Bureau 2000).

Housing

In 2009, the total number of housing units was 4,497 (US Census Bureau 2011). The vacancy rate was 24.8 percent in June 2010 (Sperlings 2011). In 2000, there were 4,439 total housing units with 3,282 occupied for a vacancy rate of 26.1 percent (US Census Bureau 2000).

Employment

In May 2011, the work force consisted of 5,142 people, of which 4,740 people were employed and 402 people, or 7.8 percent of the population, were unemployed. This is an increase in unemployment from May 2000, when the workforce consisted of 3,825 with 3,675 employed and 150, or 3.9 percent, unemployed (Nevada Workforce 2011).

Demographics

Based on 2010 data, 76.3 percent of the population in the county was White of non-Hispanic descent. The largest minority group in the area is Hispanic or Latino, comprising 13.2 percent of the population. American Indians comprise approximately 4.2 percent of the population. In 2009, 13.3 percent of individuals were below the poverty level, compared with the state average of 12.4 percent (US Census Bureau 2010).

3.25.4 Tonopah Ranger District

The Tonopah Geothermal Decision Area covers approximately 166 acres within Nye County. Nye County was selected as the ROI for socioeconomic and environmental justice analysis as the impacts of leasing are likely to occur within this region.

Population

Total population within the county was 43,946 in 2010 (US Census Bureau 2010), a more than 35 percent population increase over 2000 when the population was 32,485 (US Census Bureau 2000).

Housing

In 2009, the total number of housing units was 16,455 (US Census Bureau 2011). The vacancy rate was 8.9 percent in June 2010 (Sperlings 2011). In 2000, there were 15,934 total housing units with 13,309 occupied for a vacancy rate of 16.5 percent (US Census Bureau 2000).

Employment

In May 2011, the work force consisted of 17,211 people, of which 14,678 people were employed, and 2,533 people, or 14.7 percent of the population, were unemployed. This is an increase in unemployment from May 2000, when the workforce consisted of 14,071, with 13,197 employed and 874, or 6.2 percent, unemployed (Nevada Workforce 2011).

Demographics

Based on 2010 data, 78.9 percent of the population in the county was White of non-Hispanic descent. The largest minority group in the area is Hispanic or Latino, comprising 13.6 percent of the population. American Indians comprise approximately 1.6 percent of the population. In 2009, 14.1 percent of individuals were below the poverty level, compared with the state average of 12.4 percent (US Census Bureau 2010).

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